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The 8th Edition of the "Tool Kit" contains a graphic summary of acquisition policies and managerial skills frequently required by DoD program managers.

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DSMC PROGRAM MANAGERS TOOL KIT

Eighth Edition
July 1998

PREFACE

This 8th Edition of the "Tool Kit" contains a graphic summary of acquisition policies and managerial skills frequently required by DoD program managers. It is an updated version of a "Tool Box" that was first developed by Mr. Charles F. Schied of PMC 92-1. For convenience, it is sized for insertion into a 3-hole, 5-1/2" x 8-1/2" "Day Runner." The information was extracted from material presented by the Defense Systems Management College (DSMC) in the Intermediate Systems Acquisition Course (ISAC) and Advanced Program Management Course (APMC). It reflects Change 3 to DoD 5000.2-R. Material from the DSMC Learning Resource Center was also used.

Users of the "Tool Kit" are reminded that this summary is a guide only and should not be used as a substitute for official policy guidance. Periodic review of official policy guidance is recommended.

ACKNOWLEDGMENTS

As Sponsor of this "Tool Kit" Project, I wish to recognize the following members of the DSMC faculty and staff for their input to this 8th Edition: Mr. Bill Bahnmaier, who coordinated the input and editing of material from various departments; Ms. Johnnie Kennedy of the Principles of Program Management Department for typing, formatting and editing support; Mr. Chuck Cochrane of the Acquisition Policy Department for his significant input and editing support; Mr. Eduard Boyd of the Visual Arts Department for his support in preparing and editing drafts for Lionheart printing; Mr. Frank Scavotto, Mr. Mike King, and LI1 Andy Stowell, USN, of the Defense Automated Printing Service (DAPS) for their excellent "Lionheart" printing support. Other significant contributors were Dr. Don Fujii, MD Department; Mr. Frank Meneely, CM Department; Mr. Paul Alfieri, TE Department; Dr. John Snoderly and Mr. Randy Zittle, SE Department; Dr. Ben Rush, CF Department; Mr. Walt Weedman, formerly of the EV Department; Mr. John Riffee, LS Department; Mr. Gerry Land and Ms. Siobhan Tack, FM Department; Lt Col Russ Barbero, MM Department; and Mr. Richard Kwatnoski of the Executive and International Course Department. I also want to thank Mr. Richard Reed, Provost, who provided both encouragement and command support for the project.

John T. Shannon
Dean Faculty Division

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DSMC PROGRAM MANAGERS TOOL KIT

I
ACQUISITION MANAGEMENT

- Things that make you go "Hmmm?..."

  "The only thing most auditors fix is the blame."

  "Experience is something you got just after you needed it."

  "People are smarter than they look; listen to them."

  "The last 10 percent of the performance sought generates one-third of the cost and two-thirds of the problems."

  "Never open a can of worms unless you want to go fishing."

  "Those who believe it cannot be done will please get out of the way of those who are busy doing it."

- Things we should always remember.

  "Be honest in everything you say, write and do."

  "Be good to your people, and they will be good to you."

  "Forgiveness is easier to obtain than permission."

  "Keep everyone informed; when in doubt, coordinate."

  "Be the first to deliver bad news."

  "If you are sitting at your desk, you are not managing your program."

THE PROGRAM MANAGER'S BILL OF RIGHTS AND RESPONSIBILITIES

RIGHTS:

Program Managers have the RIGHT to:

- A single, clear line of authority from the Defense Acquisition Executive.
- Authority commensurate with their responsibilities.
- Timely decisions by senior leadership.
- Be candid and forthcoming without fear of personal consequences.
- Speak for their program and have their judgments respected.
- The best available training and experience for the job.
- Adequate financial and personnel resources.

RESPONSIBILITIES:

Program Managers have the RESPONSIBILITY to:

- Accept program direction from acquisition executives and implement it expeditiously and conscientiously.
- Manage their programs to the best of their abilities within approved resources.
- Be customer focused and provide the user with the best, most cost-effective systems or capabilities.
- Innovate, strive for optimal solutions, seek better ways to manage, and provide lessons-learned to those who follow.
- Be candid about program status, including risks and problems as well as potential solutions and likely outcomes.
- Prepare thorough estimates of financial and personnel resources that will be required to manage the program.
- Identify weaknesses in the acquisition process and propose solutions.

Defense Acquisition Milestones & Phases

Mission need requires materiel solution. Mission Need Statement (MNS) prepared	Evaluate feasibility of alternative concepts/ determine most promising concept(s)/ solution(s)	Design system/ demonstrate critical processes & technologies (early prototypes)	Mature and finalize selected design/validate manufacturing & production processes/ test & evaluate system	Produce system & field it/monitor mission performance/support fielded system/modify/ upgrade as required	Control materiel for demilitarization/ ensure disposal complies with environmental requirements
DETERMINATION OF MISSION NEED	PHASE 0 CONCEPT EXPLORATION	PHASE I PROGRAM DEFINITION & RISK REDUCTION	PHASE II ENGINEERING & MANUFACTURING DEVELOPMENT	PHASE III PRODUCTION, FIELDING/ DEPLOYMENT, & OPERATIONAL SUPPORT	DEMILITARIZATION & DISPOSAL

MS 0

Approval to Conduct Concept Studies

Approval of:
- Short-term concept studies
- Phase 0 exit criteria

MS 1

Approval to Begin a New Acquisition Program

Approval of:
- Acquisition Strategy
- Cost As an Independent Variable (CAIV) objectives
- Initial Acquisition Program Baseline (APB)
- Phase I exit criteria
- TEMP (by DOT&E & DTSE&E)*

MS II

Approval to Enter Engineering & Manufacturing Development

Approval of:
- Acquisition Strategy
- CAIV objectives
- Updated APB
- LRIP quantities
- Live Fire T&E waiver (if applicable)
- Phase II exit criteria
- TEMP (by DOT&E & DTSE&E)*

MS III

Production or Fielding/ Deployment Approval

Approval of:
- Acquisition Strategy
- Production (weapon systems), or deployment (information systems)
- Updated APB
- Phase III exit criteria (if applicable)

*OSD T&E Oversight Programs only

ACQUISITION CATEGORIES (ACAT)

Major Defense Acq Pgms	**ACAT 1D:**	• DAB Review • Designated by DAE • Decision by DAE	$355M RDT&E or $2.135B Procurement (FY96 Constant $)
	ACAT IC:	• Component Review • Designated by DAE • Decision by Svc Sec/CAE	
Major AIS Acq Pgms	**ACAT IAM:**	• MAISRC Review • Designated by ASD(C3I) • Decision by ASD(C3I)	$360M Life Cycle Cost or $120M Total Prog. Cost or $30M Prog. Cost in any single year (FY96 Constant $)
	ACAT IAC:	• Component Review • Designated by ASD(C3I) • Decision made by Comp. Chief Information Officer	
Major Systems	**ACAT II:***	• Does Not Meet ACAT I Criteria • Designated by Svc Sec/CAE • Decision by Svc Sec/CAE	$140M RDT&E or $645M Procurement (FY96 Constant $)
all others (except for Army Navy, USMC)	**ACAT III:**	• Does Not Meet ACAT I, IA or II Criteria • Designated IAW Component policy • Decision at lowest appropriate Level	No Fiscal Criteria
Army Navy USMC	**ACAT IV:**	• Not otherwise designated ACAT I, IA, II or III • Designated IAW Component Policy • Navy/USMC ACAT IVT/IVM • Decision at lowest appropriate level	See AR 70-1 (Army) & SECNAVINST 5000.2B (Navy and Marine Corps)

*Army has an ACAT IIA category for AIS reviewed at Army CIO level

ACQUISITION STRATEGY ELEMENTS (ACAT I & IA PROGRAMS)

- Open Systems Objectives
- Sources
  - Commercial & NDI
  - Dual Use Technologies & Use of Commercial Plants
  - Critical Product & Technology Competition
  - Industrial Capability
  - Leasing (10 USC 2401a)
- Cost, Schedule, and Performance Risk Management
- Cost As an Independent Variable
  - Cost Performance Trade-offs
  - Cost Management Incentives
- Contract Approach
  - Competition
  - CALS Integrated Data Environment
  - Best Practices
  - Advance Procurement *
  - Integrated Baseline Reviews
- Management Approach
  - Streamlining
  - Information Sharing & Oversight
  - International Cooperation (10 USC 2350) *
  - Assignment of PEO
  - Use of DCMC Tech. Support
  - Joint Program Management
- Environmental, Safety, & Health Evaluation (42 USC 4321-47)
- Source of Support
- Warranties *

* normally not applicable to AIS programs

ACQUISITION REFORM INITIATIVES

- Integrated Product and Process Development and Integrated Product Teams
- Movement from Detailed Design Specifications and Process Standards to Performance and/or Commercial Specifications
- Single Process Initiative
- DoD Cost/Schedule Control System Criteria Replaced by Industry Standard Guidelines for Earned Value Management System (EVMS)
- Commercial and Non-Developmental Item Acquisition and Practices
- Cost As an Independent Variable (CAIV)
- Open Systems Design and Interoperability
- Rewrite of DoDD 5000.1 and DoD 5000.2-R to streamline policies and procedures
- Defense Acquisition Deskbook
- Defense Acquisition Pilot Programs
- Implementation of Federal Acquisition Streamlining Act (FASA), Federal Acquisition Reform Act (FARA) and Information Technology Management Reform Act (ITMRA);
  (latter two are now known as Clinger-Cohen Act)
- Electronic Commerce/Electronic Data Interchange
- Collection and Use of Past Performance Information
- Advanced Concept Technology Demonstrations (ACTD)
- Acquisition Reform Benchmarking Initiative
- Acquisition Workforce Personnel Demonstration Program
- Contract Administration Reform
- Procurement Process Reform
- Performance Based Service Contracting
- Defense Reinvention Impact Center (RIC) -- Goals by Year 2000
- Total Ownership Costs (TOC)

PLANNING TO SUPPORT ACQUISITION PROCESS

- Planning to support the acquisition process is accomplished within the Integrated Product and Process Development (IPPD) environment.

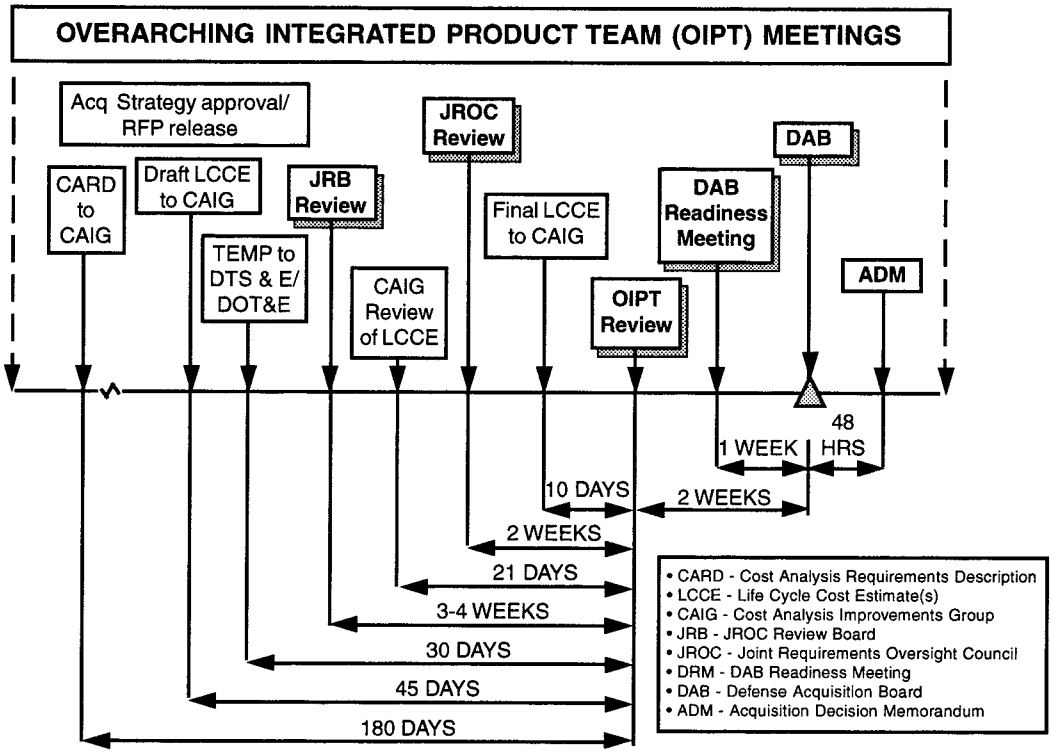
- Program plans are for use by the PM and the integrated product teams (IPTs) that support the PM and are discretionary.

- There are three exceptions where specific plans are required: The Acquisition Plan required by the FAR/DFARS; the Command, Control Communications, Computers and Intelligence, (C4I) Support Plan and the TEMP -- the latter two are both required by DoD 5000.2-R.

- Typically, the following areas will require some level of program office planning:

  - Acquisition Strategy (see page 5)
  - Risk Management
  - Systems Engineering
  - Computer/Software Devel/PDSS
  - Logistics Support/Post Prod Spt
  - Human Systems Integration
  - Program Protection
  - Deployment/Fielding
  - Training Development
  - Manufacturing
  - Technology Assessment & Control
  - Integrated Testing

DAB Timeline (Milestones I-III)



Information for Milestone Reviews
ACAT I and ACAT IA Programs

Information NOTE: MDA may waive non-statutory requirements	Milestone				Reference	
	0	I	II	III	DoD 5000.2-R	Other
Acquisition Program Baseline (APB) [1]		X	X	X	Part 3.2.2	10 USC 2435
Acquisition Strategy (9 elements - see next chart)		X	X	X	Part 3.3	
Analysis of Alternatives (AOA) [2]	X	X	[2]	[2]	Part 2.4	
Acquisition Decision Memorandum (ADM)	X	X	X	X	Part 5.2.1	
Affordability Assessment		X	X	X	Part 2.5.2	DoDD 5000.1
Beyond Low Rate Initial Production (LRIP) Report [3]				X	Part 6.3.3	10 U SC 2399
Component Cost Analysis (CCA)		X	X	X	Part 5.6	DoDD 5000.4
Consideration of Technological Issues	X	X	X	X	Part 1.4	
Cost Analysis Requirements Description (CARD)		X	X	X	Part 3.5.1	DoDD 5000.4
Exit Criteria	X	X	X	X	Part 3.2.3	
Full Funding of Dab & MAISRC Programs		X	X	X	Part 2.5.1	
Independent Estimate of Life Cycle Cost		X	X	X	Part 3.5.1	10 USC 2434
Interoperability Certification (C3I Systems)				X		DoDI 4630.8
Live Fire Test & Evaluation Waiver Certification [3]				X	Part 3.4.9	10 USC 2366
Live Fire Test & Evaluation (LFT&E) Report [3]				X	Part 6.3.2	10 USC 2366
Legality of Weapons Under International Law			X	X		DoDD 5000.1
Legality of Weapons Under International Law				X	Part 1.4.4.	10 USC 2400
Manpower Estimate [3]			X	X	Part 3.5.2	10 USC 2434
Mission Need Statement (MNS)	X				Part 2.3	CJCSI 3170.01
Operational Requirements Document (ORD)		X	X	X	Part 2.3	CJCSI 3170.01
Overarching IPT (OIPT) Leader's Report [4]	X	X	X	X	Part 5.4.1	
OIPT Staff Assessments [4]	X	X	X	X	Part 5.4.1	
Program Office Estimate (POE) (life cycle costs)		X	X	X	Part 3.5.1	DoDD 5000.4
Provisions for Evaluation of Post Deployment Support		X	X	X	Part 1.5.4	
Requirement for Program Under DoD Strategic Plan	X	X	X	X	Part 1.5	
Test & Evaluation Master Plan (TEMP)		X	X	X	Part 2.2	
Test Results (DT&E, OT&E, LFT&E, etc..)		X	X	X	Part 3.4.11	10 USC 2399
System Threat Assessment [3]			X	X	Part 6.3.1	10 USC 139

[1] Including CAIV based objectives.
[2] MS 0 for ACAT IA; MS I for ACAT I. May be useful if updated for MS II; unlikely to be required at Milestone III).
[3] Normally not applicable to ACAT IA.
[4] ACAT ID and ACAT IAM programs only.

Information For Milestone Reviews
ACAT II and III* Programs

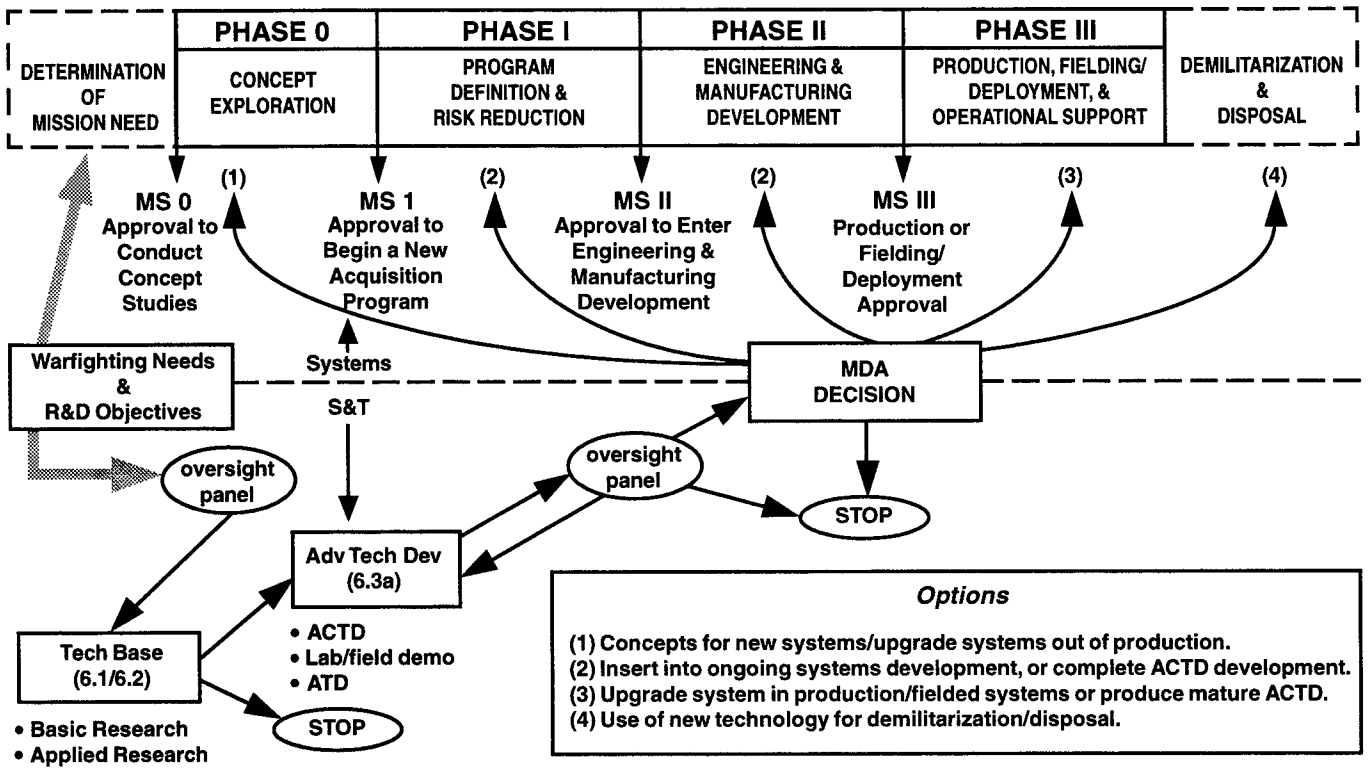
Information Element NOTE: MDA may waive non-statutory requirements	Milestone				Reference	
	0	I	II	III	Primary	Other/Related
Acquisition Program Baseline (APB) [1]		X	X	X	DoDD 5000. 1, D. 3. g	DoD 5000. 2-R, 3.2.2
Acquisition Strategy		X	X	X	DoD 5000. 2-R, 3. 3	
Affordability		X	X	X	DoDD 5000. 1, D, 1. a	DoD 5000. 2-R, 2.
Environmental Safety & Health (ESH) Assessment [2]		X	X	X	DoD 5000. 2-R, 3. 3. 7	42 USC 4321-47
Interoperability Certification (C3I Systems)				X	DoDI 4630. 8	
Legality of Weapons Under International Law			X	X	DoDD 5000. 1, D. 2. j	
Life Cycle Cost Estimate		X	X	X	DoDD 5000. 1, D. 1. g	DoD 5000. 2-R, 3.5.1
Live Fire Test & Evaluation Waiver Certification [3,4]			X		DoD 5000. 2-R, 3. 4. 9	10 USC 2366
Live Fire Test & Evaluation Report [3,4]				X	DoD 5000. 2-R, 6. 3. 2	10 USC 2366
Low Rate Initial Production (LRIP) Quantities [2,3,5]			X		DoD 5000. 2-R, 1. 4. 4. 1	
Mission Need Statement (MNS)	X				CJCSI 3170. 01	DoD 5000. 2-R, 2.3
Operational Requirements Document (ORD)		X	X	X	CJCSI 3170. 01	DoD 5000. 2-R, 2.3
Risk Assessment [2]		X	X	X	DoDD 5000. 1, D. 1. d	
Staff Assessments	X	X	X	X	DoDD 5000. 1, D. 2. g	
Test & Evaluation Master Plan (TEMP) [6]		X	X	X	DoD 5000. 2-R, 3. 4. 11	10 USC 2399
Test Results (DT/ OT/ LFT&E) [6]			X	X	DoD 5000. 2-R, 6. 3. 1	10 USC 139

MDA's for ACAT II & III* programs have wide latitude and broad authority over the content and format of many (but not all) of these information elements

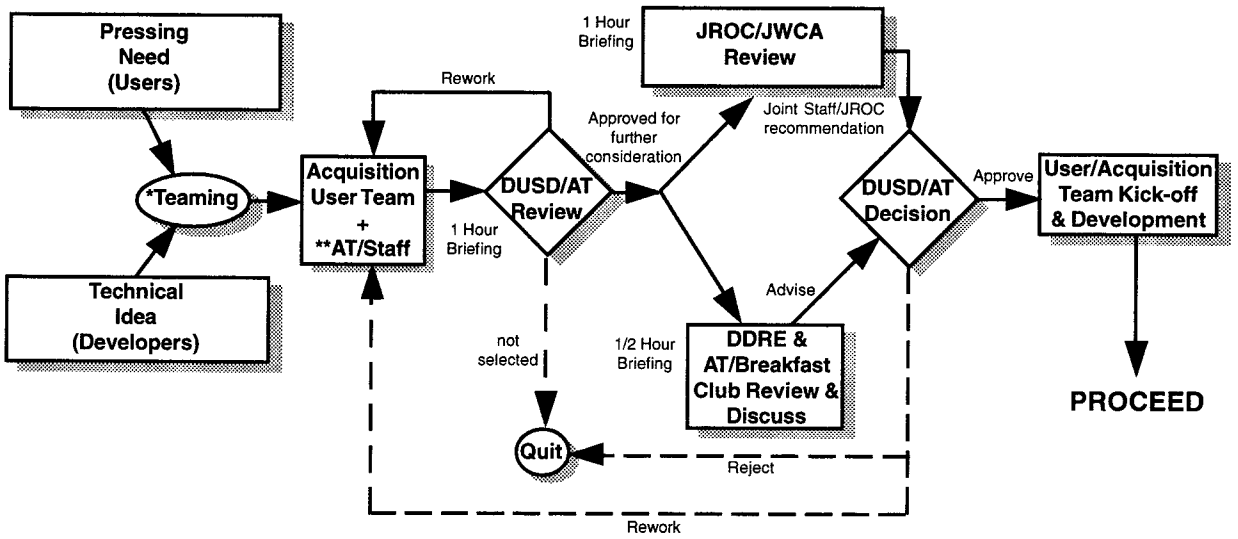
Notes:
1. Including Cost as An Independent Variable (CAIV) based objectives.
2. May be included in PM's acquisition strategy.
3. Normally not required for AIS programs.
4. Programs subject to live fire T&E legislation.
5. ACAT II only; how ever, it is DoD Policy to limit LRIP quantities for all ACATs.
6. Programs on OSD T&E Oversight List.

**Army, Navy and Marine Corps also have an ACAT IV category. The information on this chart may also be talored for those programs.*

S&T LINKAGE TO DEFENSE ACQUISITION PROCESS



ACTD INITIATION PROCESS



*AT staff will assist, if necessary, to arrange user/developer team
**Defense Reform Initative proposes moving AT mission to DDR&E

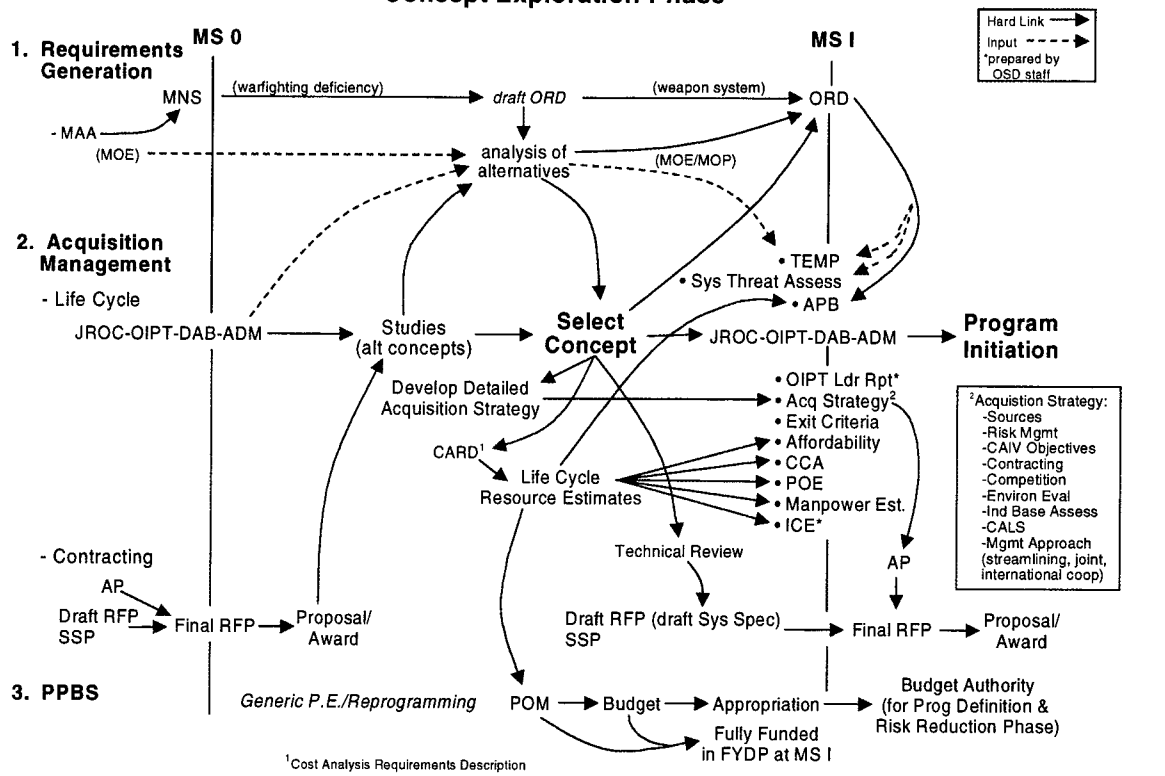
ACQUISITION PROGRAM VS. ATD & ACTD

	Acquisition Program	Advanced Technology Demonstration (ADT)	Advanced Concept Tech Demonstration (ACTD)
Motivation	• Develop, produce and field system • Cost, schedule, performance	• Demonstrate feasibility and maturity • Reduce technical risks and uncertainties at relatively low cost	• Gain understanding of and evaluate utility prior to acquisition decision • Develop concepts of operation and doctrine
Requirement	MNS/ORD	not required	not required
Oversight	milestone decision authority	labs/R&D centers	DUSD(AT) Oversight Panel
Funding	fully FYDP funded	RDT&E	RDT&E (2yrs in field)
ACAT	I, II, III	not ACAT effort	not ACAT effort
Configuration & Testing	system/subsystem prototypes DT/OT	technology demonstrations	tech demonstrations in field environment with users ACTD
Rules	DoD 5000series/FAR	informal/FAR	Mgmt Plan/FAR
Role of User	max involvement	some involvement	max involvement

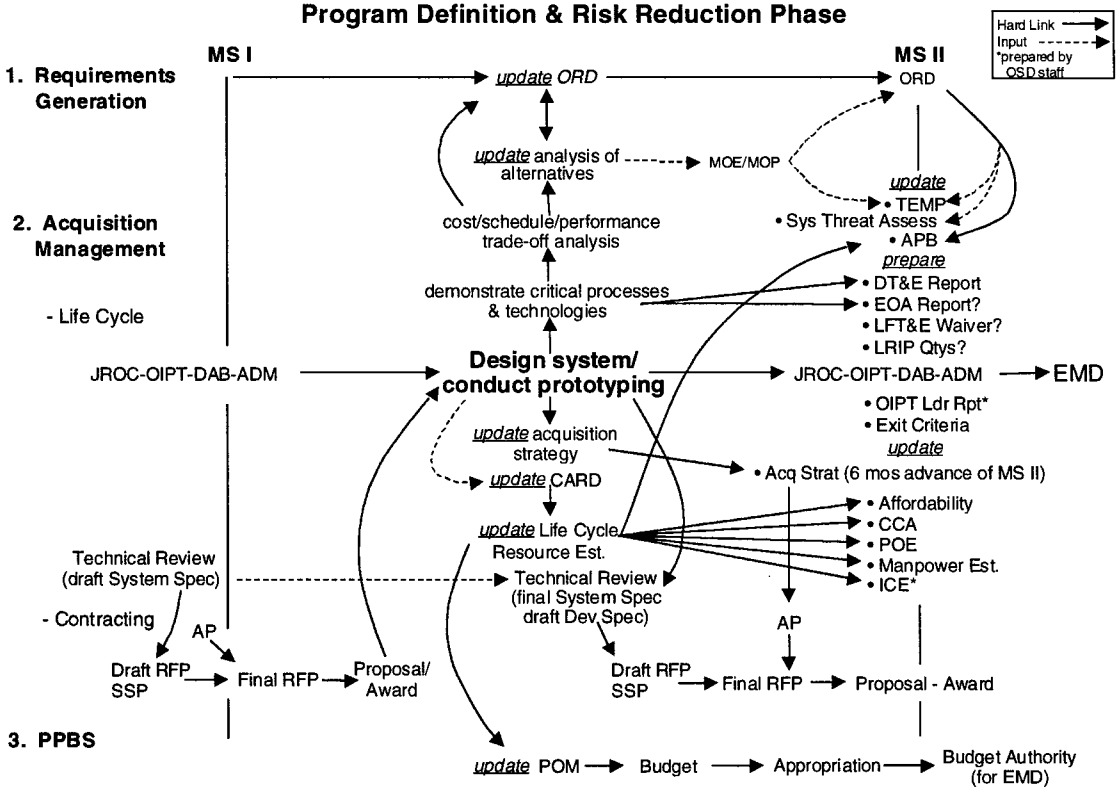
FAR: Federal Acquisition Regulation
MNS: Mission Need Statement
ORD: Operational Requirements Document
DUSD(AT): Deputy Under Sec Def (Advanced Technology)

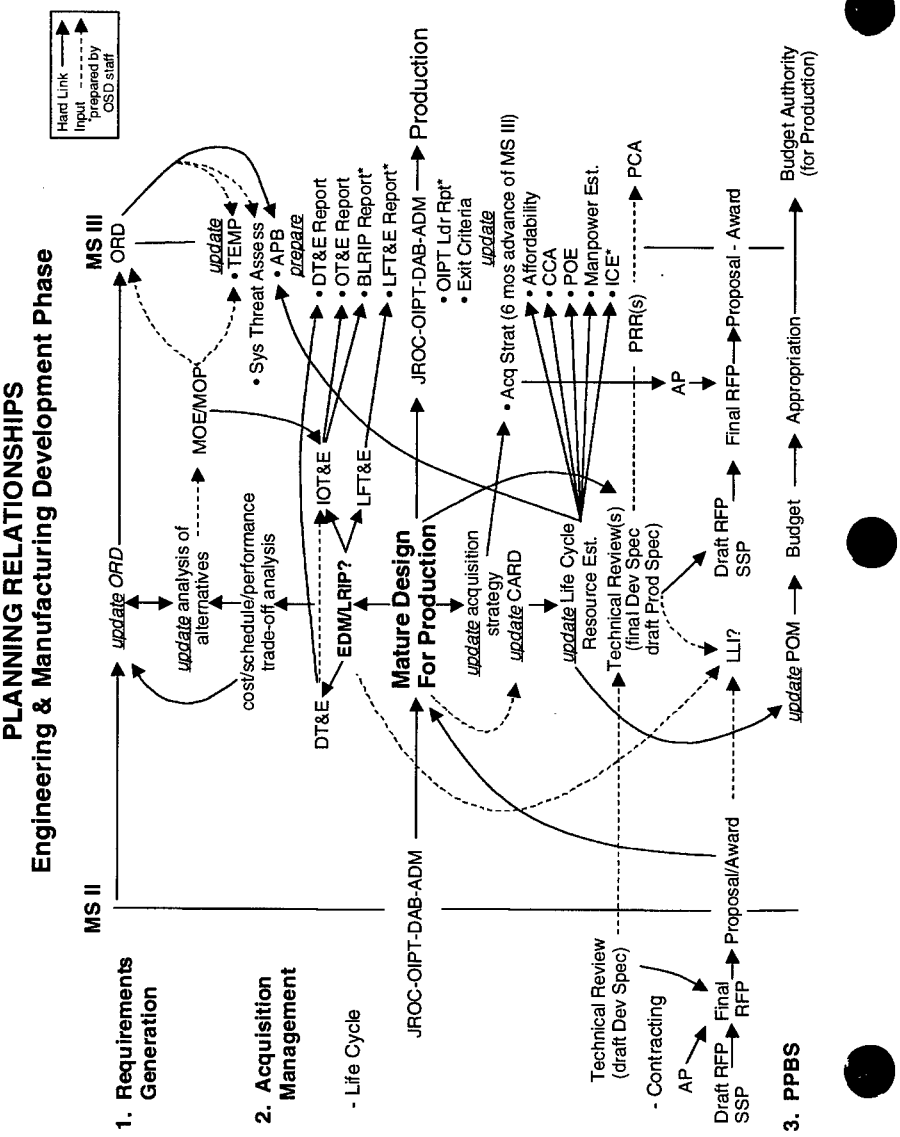
FYDP: Future Years Defense Program
RDT&E: Research, Dev, Test & Eval (appropriation)
ACAT: Acquisition Category
DT/OT: Developmental/Operational Testing

PLANNING RELATIONSHIPS
Concept Exploration Phase

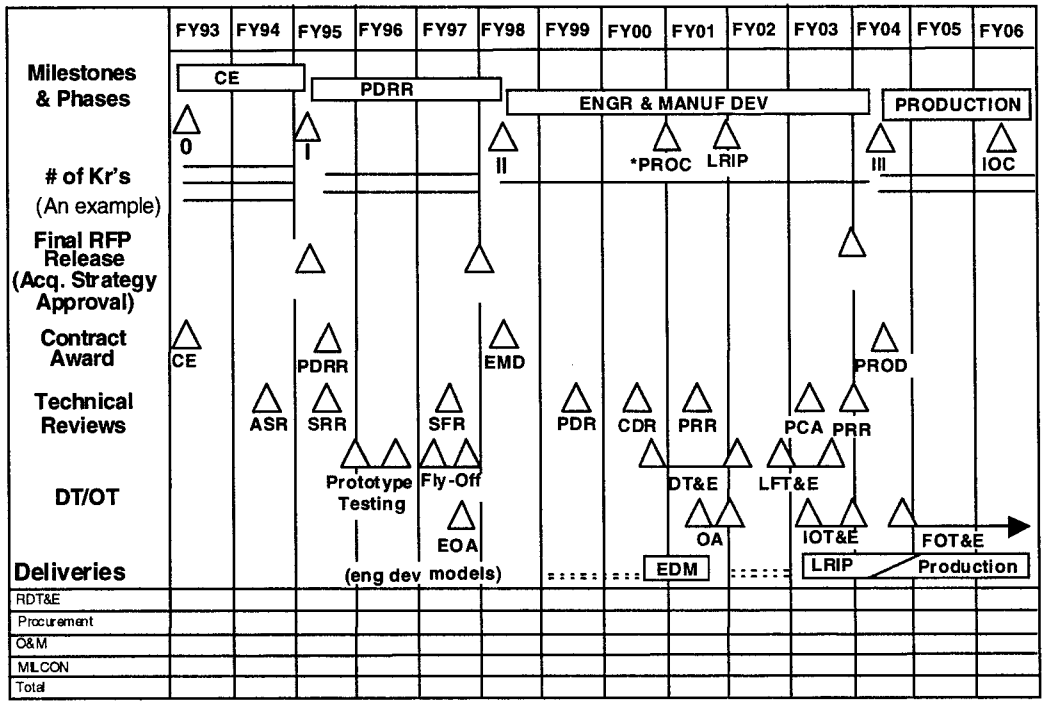


PLANNING RELATIONSHIPS
Program Definition & Risk Reduction Phase




PLANNING RELATIONSHIPS
Engineering & Manufacturing Development Phase
Hard Link
Input
*prepared by OSD staff
MS II
MS III
1. Requirements Generation
2. Acquisition Management
- Life Cycle
- Contracting
3. PPBS
ORD
update ORD
update analysis of alternatives
MOE/MOP*
cost/schedule/performance trade-off analysis
update
• TEMP
• Sys Threat Assess
• APB
prepare
• DT&E Report
• OT&E Report
• BLRIP Report*
• LFT&E Report*
DT&E
IOT&E
LFT&E
EDM/LRIP?
Mature Design
For Production
JROC-OIPT-DAB-ADM
Production
• OIPT Ldr Rpt*
• Exit Criteria
update
• Acq Strat (6 mos advance of MS III)
update acquisition strategy
update CARD
• Affordability
• CCA
• POE
• Manpower Est.
• ICE*
update Life Cycle Resource Est.
Technical Review(s) (final Dev Spec draft Prod Spec)
PRR(s)
PCA
AP
Final RFP
Proposal - Award
Technical Review (draft Dev Spec)
Draft RFP SSP
LLI?
Budget
Appropriation
Budget Authority (for Production)
update POM
Proposal/Award

PROGRAM SCHEDULE/STRUCTURE (EXAMPLE)



*MDA usually approves advance procurement for LRIP.

DoD INTERNATIONAL ARMAMENTS COOPERATION POLICY

SECDEF Memorandum 23 March 1997

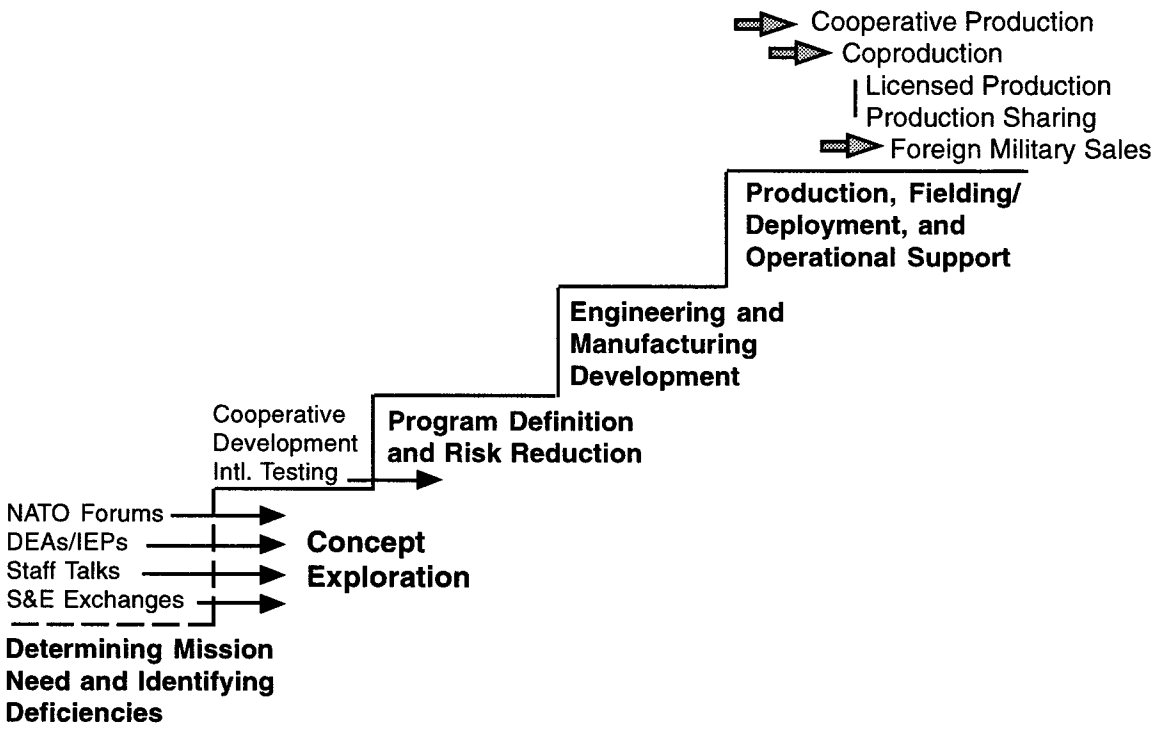
"It is DoD policy that we utilize International Armaments Cooperation to the maximum extent feasible, consistent with sound business practice and with overall political, economic, technological, and national security goals of the United States."

DEFENSE SALES VS. COOPERATIVE ACQUISITION

They are Different

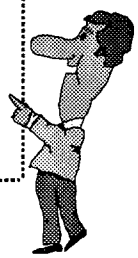
- Defense Sales
  - Any nation
  - U.S. Contracts (FMS)
  - U.S. Manages
  - Production & Support
  - DoS or DoC + DoD - USD (Policy)
  - Foreign Initiated
  - Foreign Funds (or U.S. Credit/Grants)
- Cooperative Acquisition
  - Allied or Friendly
  - U.S., Ally or NATO
  - Jointly Managed
  - All Acquisition
  - DoD - USD (A&T) + DoS and DoC
  - U.S. and/or Foreign
  - U.S. + Foreign Funds

INTERNATIONAL ACTIVITIES ASSOCIATED WITH DEFENSE ACQUISITION PHASES



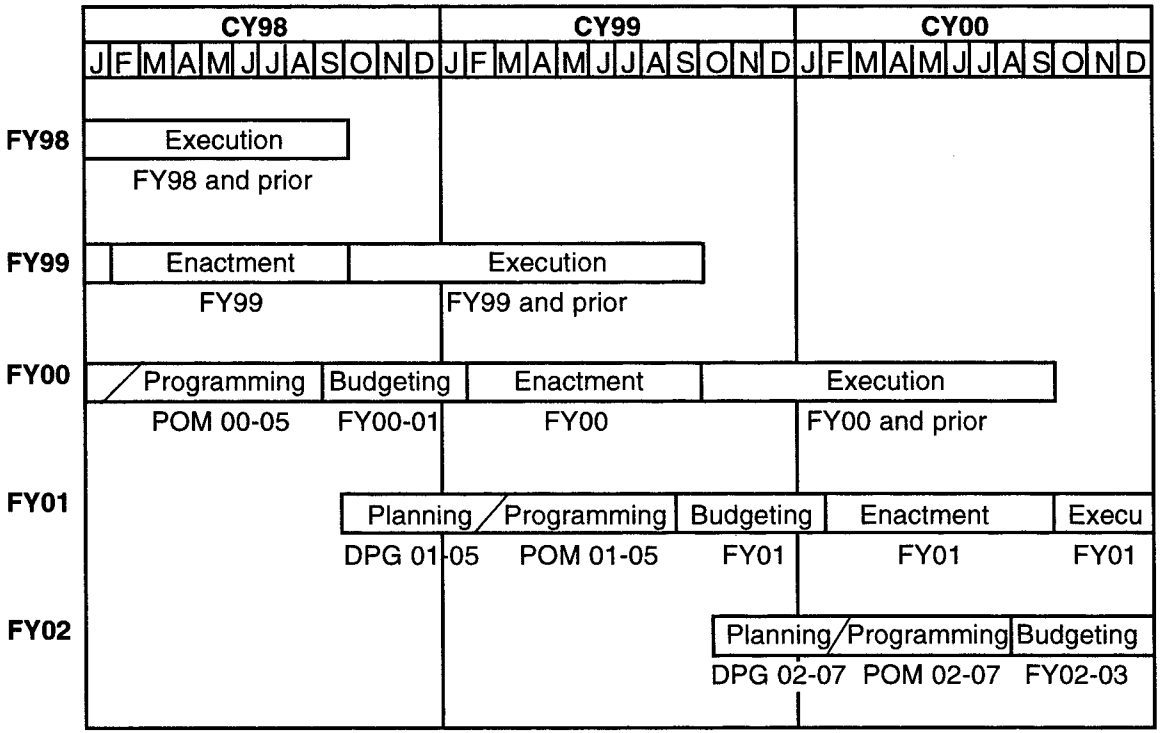
THE SCOPE OF DEFENSE COOPERATION

RDT&E	*Production & Procurement*	*Follow-on Support*
Information Exchanges	Foreign Military Sales	Cooperative Logistics Supply Support
Engineer & Scientist Exchanges	Direct Commercial Sales	Mutual Support Exchanges
Cooperative R&D	Cooperative Production (Joint Funds)	Logistics Support
Comparative or Joint Testing	Coproduction/Licensing (Foreign Funds)	Host Nation Support Defense Industrial Base
Standardization	Reciprocal Procurement	

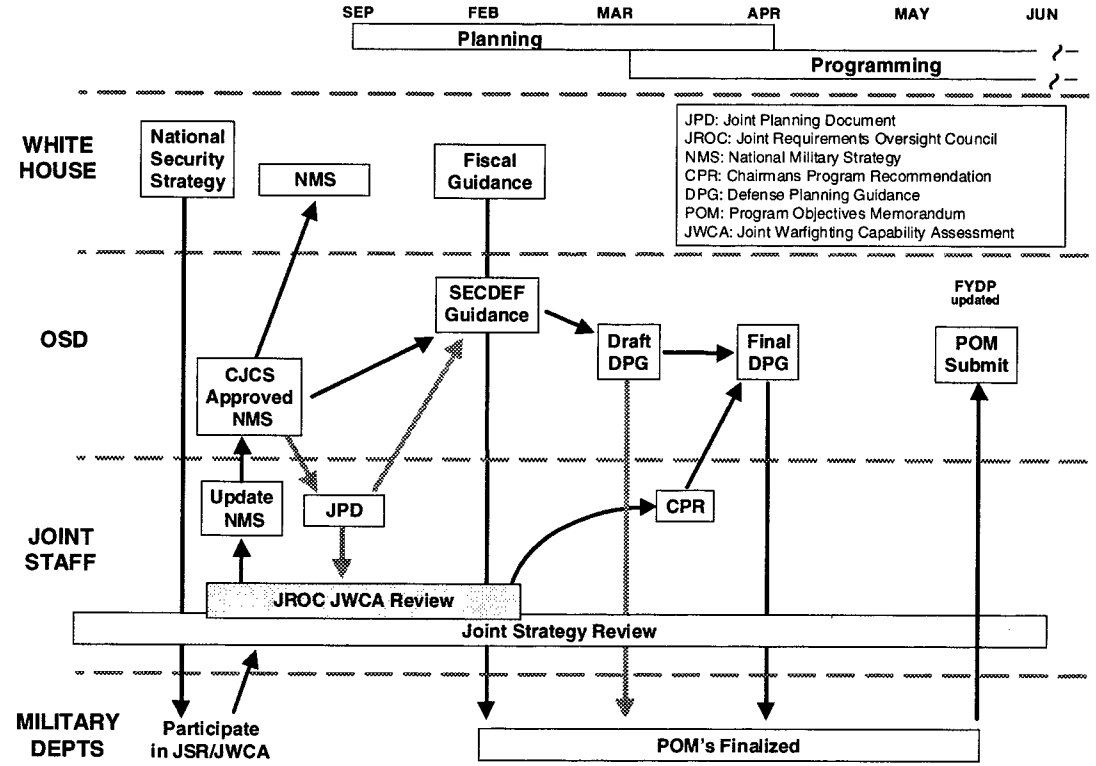


The Program Manager's Focus

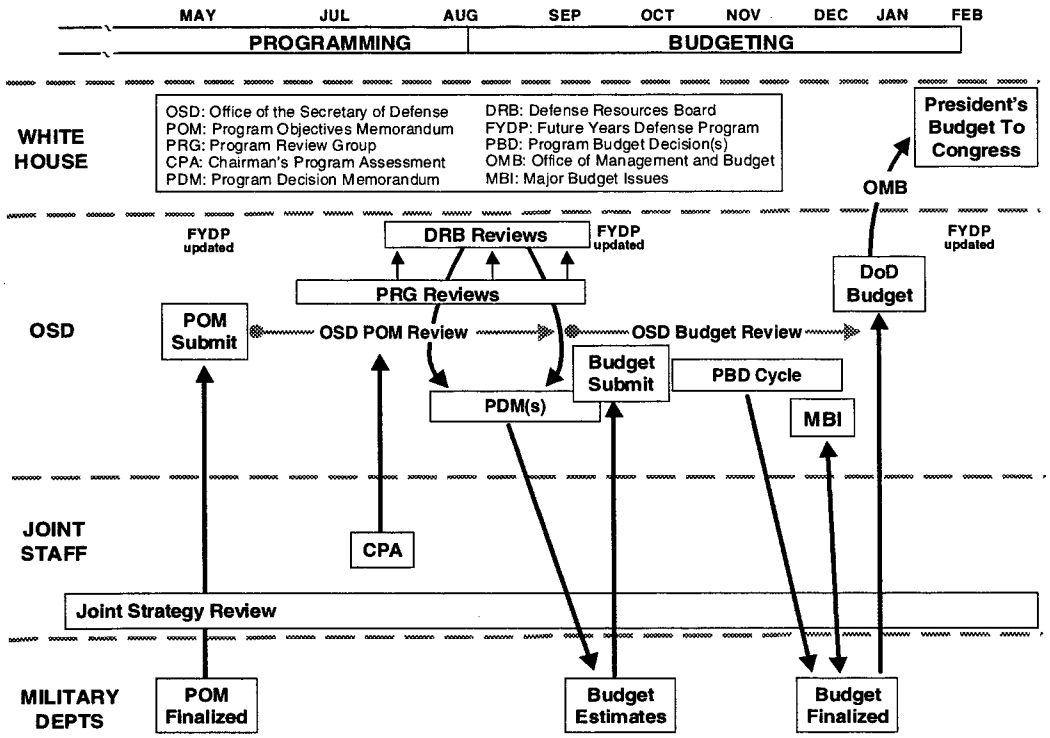
Resource Allocation Process - Overlap



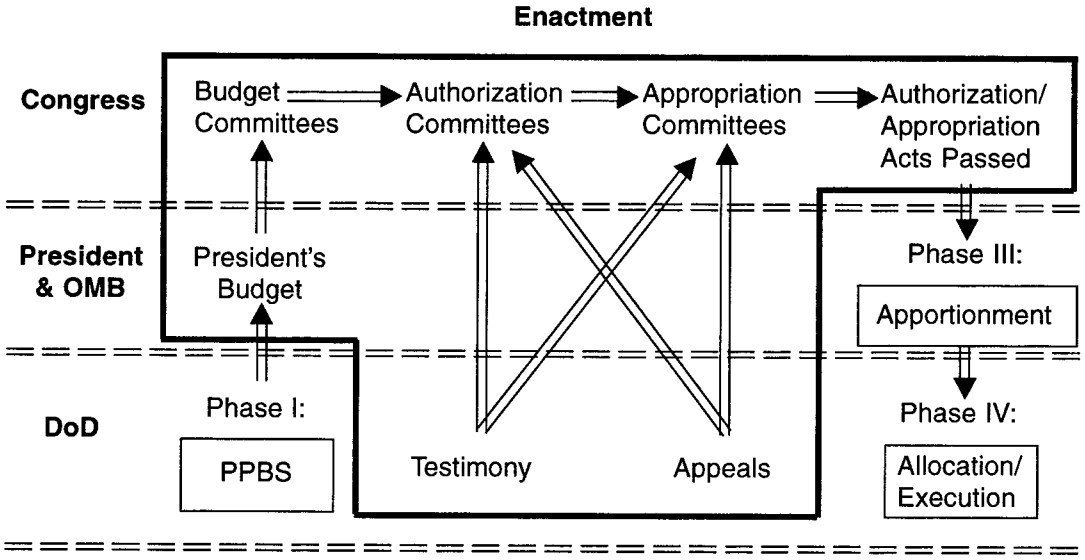
PPBS Planning and Programming Phases



PPBS - Programming & Budgeting Phases



Resource Allocation Process



PROCUREMENT APPROPRIATIONS
(ACCOUNT NUMBERS AND BUDGET ACTIVITIES)

Appropriation		Budget Activity
Army (21 -)		
Aircraft	- 2031	1. Aircraft 2. Modification of Aircraft 3. Spare & Repair Parts 4. Support Equipment & Facilities
Missile	- 2032	1. Other Missiles 2. Modification of Missiles 3. Spare & Repair Parts 4. Support Equipment & Facilities
Weapons	- 2033	1. Track Combat Vehicle 2. Weapons & Other Combat Vehicles
Ammo	- 2034	1. Ammo 2. Ammo Production Base Support
Other	- 2035	1. Tactical & Support Vehicle 2. Common & Electronic Equipment 3. Other Support Equipment
Navy (17 -)		
Aircraft	- 1506	1. Combat Aircraft 2. Airlift Aircraft 3. Trainer Aircraft 4. Other Aircraft 5. Modification of Aircraft 6. Aircraft Spare & Repair Parts 7. Aircraft Support Equipment & Facilities
Weapons	- 1507	1. Ballistic Missiles 2. Other Missiles 3. Torpedoes & Related Equipment 4. Other Weapons 5. Other Ordnance 6. Spare & Repair Parts
Shipbuilding & Conversion	- 1611	1. Not Applicable 2. Other Warship 3. Amphibious Ships 4. Mine Warfare & Patr ol Ships 5. Auxiliary, Craft & Prior Year
Other	- 1810	1. Ship Support Equipment 2. Common & Electronic Equipment 3. Aviation Support Equipment 4. Ordnance Support Equipment 5. Civil Engineer Support Equipment 6. Supply Support Equipment 7. Personal & Command Support Equipment 8. Spare & Repair Parts
Marine Corps (17 -)		
	- 1109	1. Ammo 2. Weapons & Combat Vehicles 3. Guided Missiles & Equipment 4. Common & Electronic Equipment 5. Support Vehicles 6. Engineering & Other Equipment 7. Spare & Repair Parts

PROCUREMENT APPROPRIATIONS
(ACCOUNT NUMBERS AND BUDGET ACTIVITIES)
(Continued)

Appropriation		Budget Activity
Air Force (57-)		
Aircraft	- 3101	1. Combat Aircraft 2. Airlift Aircraft 3. Trainer Aircraft 4. Other Aircraft 5. Modification of In-Service Aircraft 6. Aircraft Spare & Repair Parts 7. Aircraft Support Equipment Facilities
Missile	- 3020	1. Ballistic Missiles 2. Other Missiles 3. Modification of In-Service Missile 4. Spare & Repair Parts 5. Other Support 6. Ammo
Other	- 3080	1. Munitions & Associated Equipment 2. Vehicle Equipment 3. Electronic & Telecommunications Equipment 4. Other Base Maintenance & Support Equipment
Defense (97-)		
Defense-Wide	- 0300	1. Major Equipment 2. Special Operations Command 3. Chemical/Biological Defense
National Guard & Reserve Equipment	- 0350	1. Reserve Equipment 2. National Guard Equipment
Defense Production Activity Purchase	- 0360	1. Defense Production Activity Purchases
Chemical Agents & Munitions Destruction	- 0390	1. Chemical Agents & Munitions Destruction-R D T&E 2. Chemical Agents & Munitions Destruction-Procurement 3. Chemical Agents & Munitions Destruction-O&M

RDT&E APPROPRIATIONS
(ACCOUNT NUMBERS)

Appropriation	*Account Number*
RDT&E, Army 21	- 2040
RDT&E, Navy 17	- 1319
RDT&E, Air Force 57	- 3600
RDT&E, Defense Wide 97	- 0400
Development T&E 97	- 0450
Operational, T&E 97	- 0460

RDT&E APPROPRIATIONS
(RELATIONSHIP BETWEEN BUDGET ACIVITIES AND RESEARCH CATEGORIES)

Budget Activity	*Research Category*	*Category Nomenclature*	*Program Element #s*
* 1	6.1	Basic Research	0601xxx
* 2	6.2	Applied Research	0602xxx
* 3	6.3a	Advanced Technology Devel	0603xxx
4	6.3b	Dem/ Val	0603xxx
5	6.4	Engineer and Mfg Devel (EMD)	0604xxx
6	6.5	RDT&E Management Support	0605xxx
7	6.6	Operational System Devel	010xxx; 020xxx; 030xxx; etc.

NOTES:

1. The relationships among Budget Activities; Research Categories; and Categorie Nomenclatures were effective with the President's FY 97 Budget.

2. While the title of the Acquisition Life Cycle phase preceding EMD is now called Program Definition and Risk Reduction (PDRR) in Acquisition direct ives, Resource Management Directives still refer to Research Category associated with this acquisition phase as Dem Val.

* POM + $s OVERSIGHT BY DDR&E

SAMPLE
NAVY APPROPRIATIONS AND BUDGET ACTIVITIES

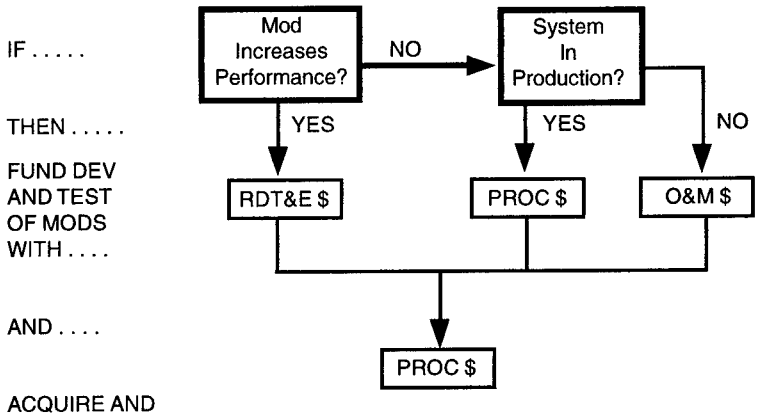
APPRN/ BUDGET ACTIVITY	RESEARCH CATEGORY NUMBER / NOMENCLATURE		BELOW THRESHOLD REPROGRAM RULES * Max In	Max Out	YEARS AVAIL FOR OBLIG PURPOSES	FUNDING POLICY
RDT&E, N			[At Program Element Level]			
1	6.1	Basic Research	$4M	Greater of $4M or 20%	2	Incremental
2	6.2	Applied Research				
3	6.3a	Advanced Tech. Devel.				
4	6.3b	Dem/ Val				
5	6.4	EMD				
6	6.5	RDT&E Mgmt Supp (T&E Ranges) (Civilian Salaries)				
7	6.6	Oper. Systems Devel. (Post-Production)				

APPRN/ BUDGET ACTIVITY	BUDGET ACTIVITY DESCRIPTION	BELOW THRESHOLD REPROGRAM RULES Max In	Max Out	YEARS AVAIL FOR OBLIG PURPOSES	FUNDING POLICY
PROCUREMENT		[At Line Item Level]			
SCN-1	Ship Conv - FBM Ships	$10M	Greater of $10M or 20%	5	Full
SCN-2	Ship Conv - Other Warships				
SCN-3	Ship Conv - Aphib Ships				
SCN-4	Ship Conv - Mine & Pat Ships				
SCN-5	Ship Conv - Aux, Craft & PY Costs				
WPN-1	Weapons Proc. - Bal. Msl			3	
WPN-2	Weapons Proc. - Other Msl				
WPN-3	Weapons Proc. - Torp & Eq.				
WPN-4	Weapons Proc. - Other Wpn				
WPN-5	Weapons Proc. - Other Ord.				
WPN-6	Weapons Proc. - Spares & Repair Parts				
OPN-1	Other Proc. - Ship SE				
OPN-2	Other Proc. - Comm/Elec Eq				
OPN-3	Other Proc. - Aviation SE				
OPN-4	Other Proc. - Ordnance SE				
OPN-5	Other Proc. - Civil Engr SE				
OPN-6	Other Proc. - Supply SE				
OPN-7	Other Proc. - Pers & Com SE				
OPN-8	Other Proc. - Spares & Rep Parts				
APN-1	Aircraft Proc. - Combat				
APN-2	Aircraft Proc. - Airlift				
APN-3	Aircraft Proc. - Trainer				
APN-4	Aircraft Proc. - Other				
APN-5	Aircraft Proc. - Mods				
APN-6	Aircraft Proc. - Spares				
APR-7	Aircraft Proc. - SE & Fac.				
O&M , N	Operations & Maintenance	$20M	No Restriction	1	Annual
MILPER, N	Military Personnel	$10M	No Restriction	1	Annual
MILCON , N	Military Construction	Lesser of +$1M or 25%	No Restriction	5	Full

* Below Threshold Reprogramming for RDT&E (for PEs) allowed for each year funds avail for obligation.

APPROPRIATIONS
(Continued)

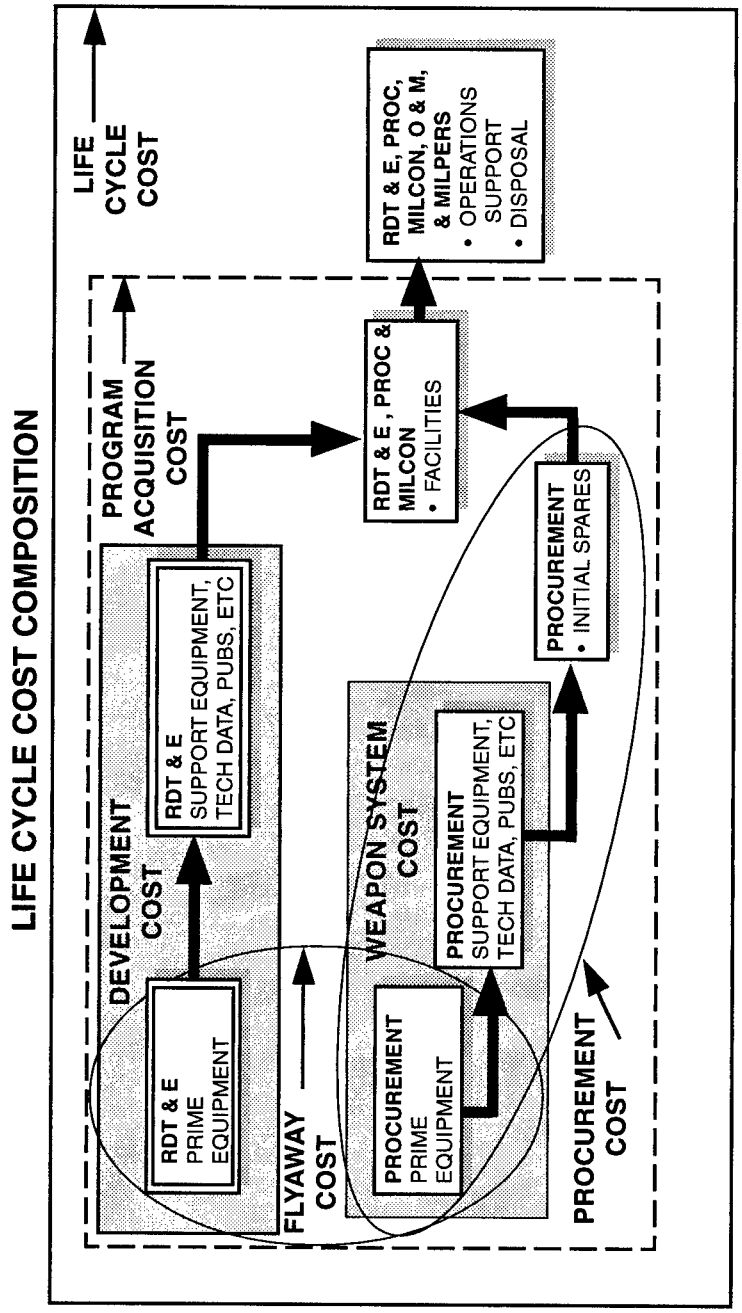
DECISION CHART FOR FUNDING PRODUCT IMPROVEMENTS



BELOW THRESHOLD REPROGRAMMING LEVELS

APPN	MAX INTO	MAX OUT	LEVEL OF CONTROL	OBL AVAIL
RDT & E	+ $ 4M	GREATER OF $4M OR 20 % OF PROGRAM ELEMENT	PROGRAM ELEMENT	2 YEARS
PROC (Incl SCN)	+ $ 10M	GREATER OF $10M OR 20 % OF LINE ITEM	LINE ITEM	3 YEARS (SCN: 5 YEARS)
O & M	+ $ 20M	NO CONGRESSIONAL RESTRICTION	BUDGET ACTIVITY SOME BA 1 SUB- ACTIVITY LIMITATIONS ON DECREASES	1 YEAR
MILPERS	+ $ 10M v	NO CONGRESSIONAL RESTRICTION	BUDGET ACTIVITY	1 YEAR
MILCON	LESSOR OF + $ 2.0M OR 25% OF PROJECT	NO CONGRESSIONAL RESTRICTION	PROJECT	5 YEARS

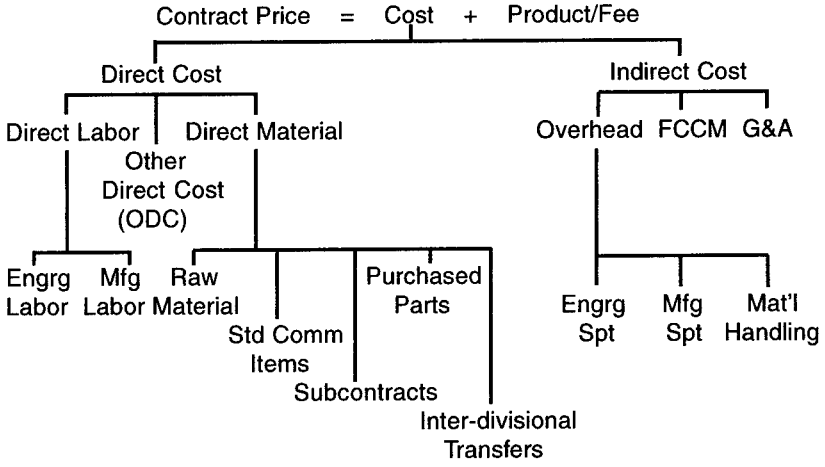
Notes: Reprogramming thresholds apply to each appropriation during entire "active" life of that appropriation.
Reference Source: Memo Change (30 Oct 96) to DoD Financial Management Regulation, Volume 3.



Source: DoDD 5000.4

CONTRACTING

COMPONENTS OF CONTRACT PRICE



TYPICAL CONTRACT TYPE BY PHASE

CE	PDRR	EMD	PROD
CPFF,FFP	CPFF, CPIF	CPIF, CPAF	FPI(F), FFP

TYPES OF CONTRACTS

Cost Type: Product not well defined; high risk; buy Best Effort; Government pays all allowable costs.

Cost Plus Fixed Fee (CPFF) - Fee same regardless of actual cost.

Cost Plus Incentive Fee (CPIF) - Fee adjusted based on actual cost (share ratio). Limit to min/max fee.

Fixed Price Type: Product well defined, low risk; buy defined deliverable.

Firm Fixed Price (FFP) - Price fixed regardless of actual cost.

Fixed Price Incentive Firm (FPI)(F)) - Price adjusted based on actual cost and share ratio.

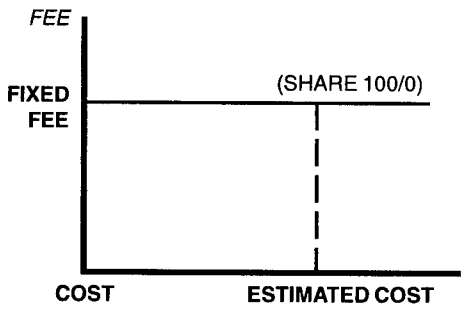
Award Fee (AF) - Can be stand alone Cost Plus Award Fee (CPAF) or combined with other cost or fixed price types. AF unilaterally determined by government based on subjective evaluation of performance.

Profit/Fee Limits: Cost type - Fee limited to 15% for R&D; 10% for Prod. Fixed price type - No statutory limitation on profit.

CONTRACT TYPE FEATURES

	FIXED PRICE	COST REIMBURSEMENT
Promise	Delivery	Best Efforts
Contract or Risk	High	Low
Cash Flow	Delivery	As Incurred
Progress Payments %	75/90/95	N/A
Administration	Low	High
Profit/Fee Limit %	None	15/10/6

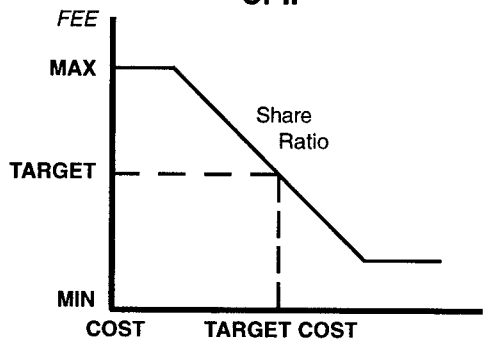
CPFF



PRICE = COST + FIXED FEE

Risk Highest To The Government
Obtains Fee Regardless of Cost

CPIF

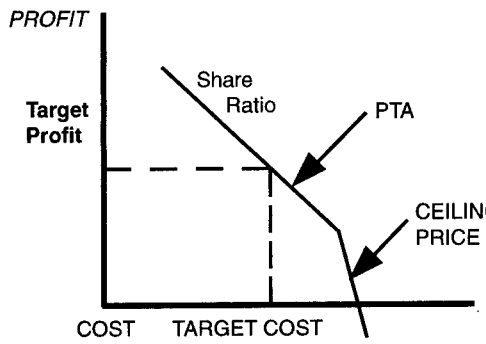


(Target) PRICE = (Target) COST + (Target) FEE

All Reasonable Cost Paid
Shared Risk Between Min/Max Fee

CONTRACT TYPE FEATURES
(Continued)

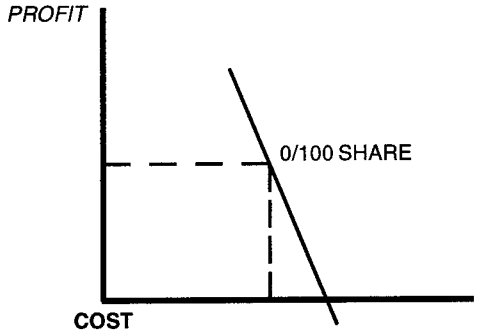
FPI(F)



(Target) PRICE = (Target) COST + (Target) Profit

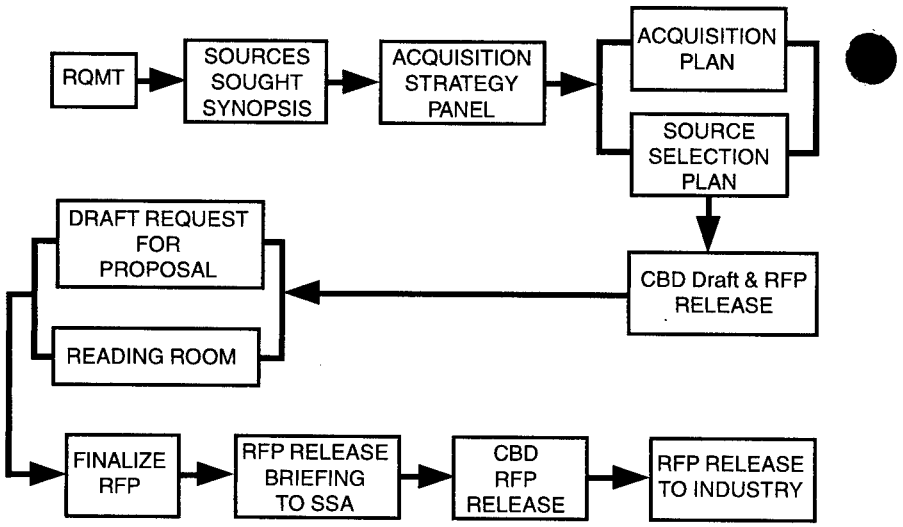
Point of Total Assumption (PTA) = $\frac{\text{CEILING PRICE - TARGET PRICE}}{\text{GOVERNMENT SHARE}}$ + Target Cost

FFP

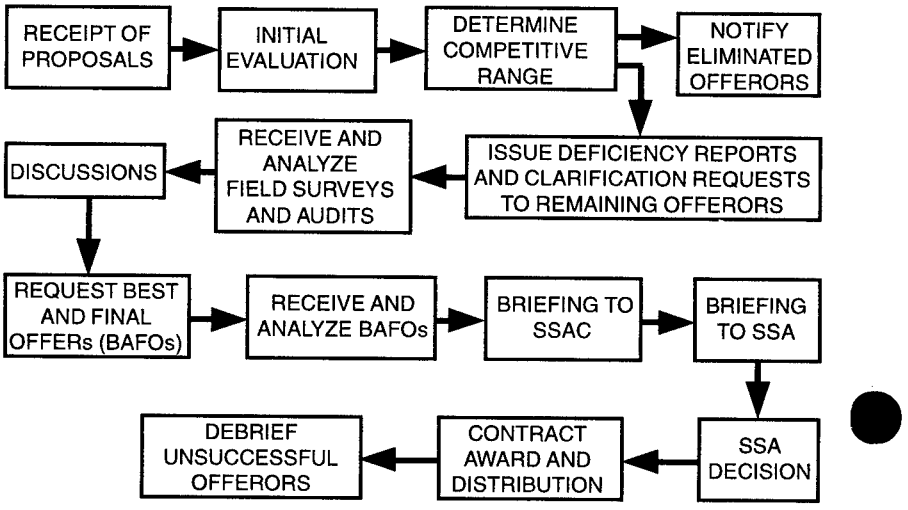


PRICE = COST + PROFIT

PRE-SOLICITATION PROCESS



POST-SOLICITATION PROCESS



CONTRACTOR PROFITABILITY RATIOS

The basic concept of profitability ratios is to measure income against revenue or against the investment required to produce it. There are three principal profitability ratios with which you should be familiar. They are:

$$\text{Return on Sales} = \frac{\text{Net Income}}{\text{Sales}}$$

1. Return on Sales which shows what percentage of dollars are left after the company has paid for all costs, interest, and taxes. It is expressed as:

$$\text{ROA} = \frac{\text{Net Income}}{\text{Total Assets}}$$

2. Return on Total Assets which looks at the efficiency with which management has used its resources, the company's assets, to generate income. It is computed as:

$$\text{ROA} = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}}$$

As noted, ROA addresses how well management utilizes the assets of the firm in generating income. The ROA formula reflects the combined result of Return on Sales and the total asset turnover ratio (sales/ total assets), broken down as follows:

$$\text{ROE} = \frac{\text{Net Income - Preferred Dividends}}{\text{Common Stockholders' Equity}}$$

3. Return on Common Stockholder's Equity measures the rate of return on the owners' investment—their equity in the company. This is also known as Return on Equity (ROE).

$$\text{ROE} = \frac{\text{Net Inc. - Pref. Div.}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Common Stockholder's Equity}}$$

ROE can also be broken into two components: these being return on assets adjusted for preferred dividends and financial leverage (a ratio reflecting the relationship of creditor to owner financing—expressed as total assets/ common stockholders equity). This is shown by:

$$\text{Earnings Per Share} = \frac{\text{Net Income Minus Preferred Dividends}}{\text{Number of Shares of Common Stock Outstanding}}$$

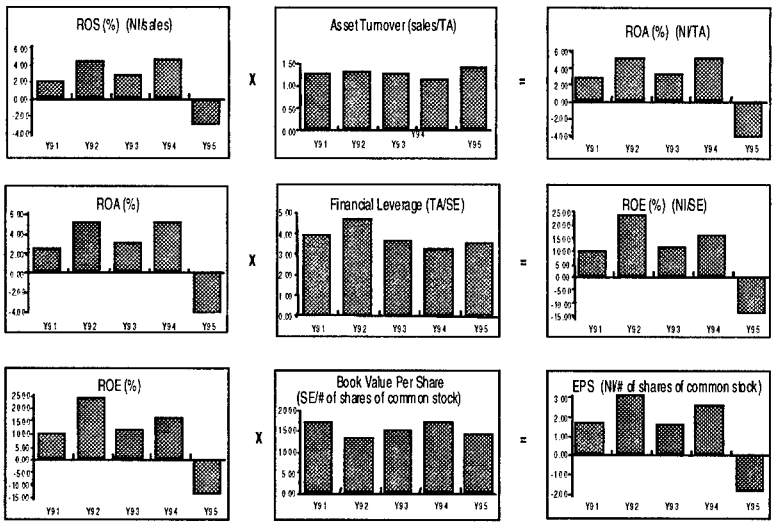
These profitability ratios give three different viewpoints concerning the "bottom line" on the income statement—how much net profit is being made on each sale, how much is being made for the assets that are employed, and how much is being made for the company owners. From an owner's perspective, another profitability ratio you may be aware of is Earnings Per Share (EPS):

FINANCIAL ANALYSIS SHEET
(EXAMPLE)

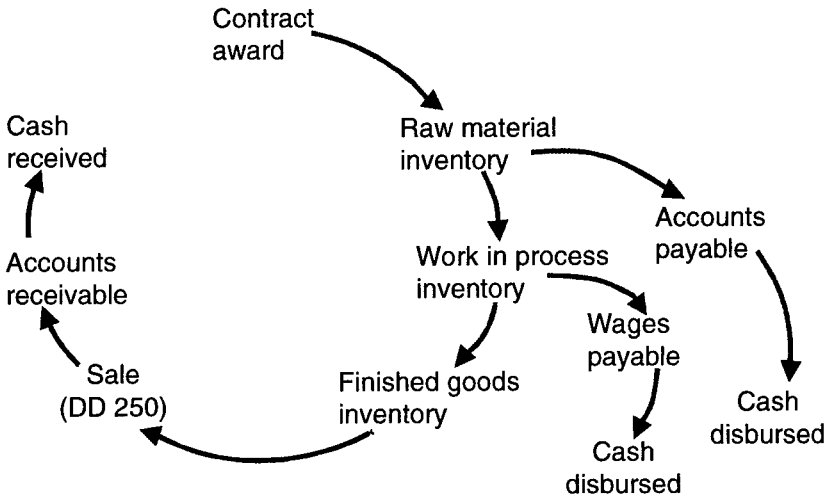
MCDONNELL DOUGLAS CORP
MD
SIC: 3721 AIRCRAFT
Fiscal Year End: 12

DUPONT ANALYSIS

Sales - (mil)		Return On Sales	X	Asset Turnover	=	ROA	ROA	x	Financial Leverage	=	ROE	ROE	X	Book Value Per Share	=	EPS
18432	Y91	1.93		1.24		2.39	2.39		3.83		9.16	9.16		16.84		1.54
17373	Y92	4.02		1.26		5.06	5.06		4.56		23.10	23.10		12.97		2.99
14474	Y93	2.48		1.20		2.99	2.99		3.52		10.52	10.52		14.49		1.53
13162	Y94	4.54		1.08		4.90	4.90		3.15		15.44	15.44		16.35		2.52
14300	Y95	-2.91		1.37		-3.97	-3.97		3.44		-13.68	-13.68		13.38		-1.83
-22%	% chg-1st to 5th	-251%		10%		-266%	-266%		-10%		-249%	-249%		-21%		-219%



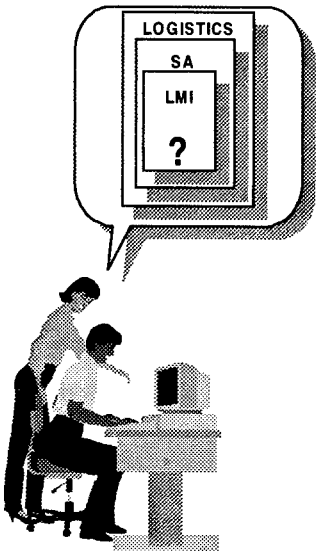
CASH CYCLE



CONTRACTOR FINANCING AND PAYMENTS

- FINANCING (External*)
  - Commercial
    - Govt specified
    - Offer or proposed
    - Interim
    - Advance
  - Non-Commercial
    - Private
      - • Trade Credit
      - • Bank Credit
        - — Revolving Credit
        - — Term Loan
    - Government
      - • For Non-Commercial
        - — Progress Payments
          - • Performance Based
          - • Cost Incurred Based
          - • % Complete
        - — Unusual Progress Payments
          - — Assignment of Claims
          - — Guaranteed Loans
          - — Advance Payments
- PAYMENTS
  - Commercial
    - Delivery
  - Non-Commercial
    - Periodic
    - Partial

* Internal Contractor Financing
— Retained Earnings



SUPPORTABILITY ANALYSES

Anything analytical that has something to do with logistics

- SUPPORTABILITY ANALYSIS (SA)
  The tailored application of engineering efforts during acquisition, to identify/ solve logistics issues through an iterative SE process of definition, synthesis, tradeoff, T&E.

- LOGISTICS MANAGEMENT INFORMATION (LMI):

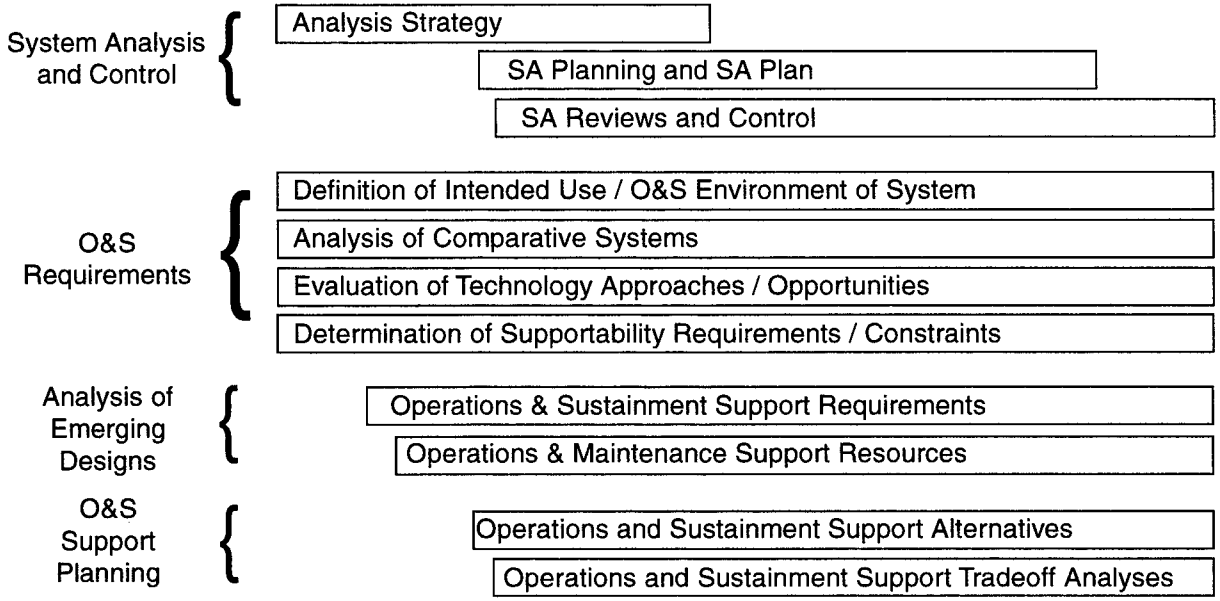
  The documentation associated with SA.

BEST PRACTICE:
Supportability Analyses

- Tailored!
- Part of iterative SE process
- Assists in
  - Defining support
  - Influencing design
- Uses (*not* duplicates) other data & analyses
- Documented and communicated

BEST PRACTICE: SUPPORTABILITY ANALYSIS ACTIVITIES

Phases				
Preconcept	Concept Exploration	Program Def. and Risk Red.	Engineering & Manuf. Dev.	Prod., Fielding/ Deployment, Operational Spt.



ACQUISITION LOGISTICS

1. *Maintenance Planning* - establishes maintenance concepts and requirements.

2. *Manpower & Personnel* - identification of personnel skills and grades required to support operation and maintenance of system.

3. *Supply Support* - determine requirements to acquire and manage spare and repair parts.

4. *Technical Data* - scientific and technical information used to support systems acquisition.

5. *Training & Training Support* - determine requirements to acquire training devices and conduct training of operators and maintenance personnel.

6. *Computer Resources Support* - identification of facilities, hardware, software and support tools to operate and support embedded computer systems.

7. *Facilities* - identify real property required to support system.

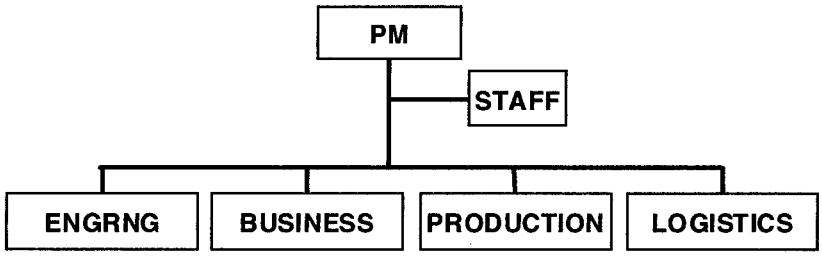
8. *Packaging, Handling, Storage and Transportation* - identify designs and methods to ensure the system is preserved, packed, stored, handled and transported properly.

9. *Support Equipment* - identify all equipment required to support operation and maintenance of the system.

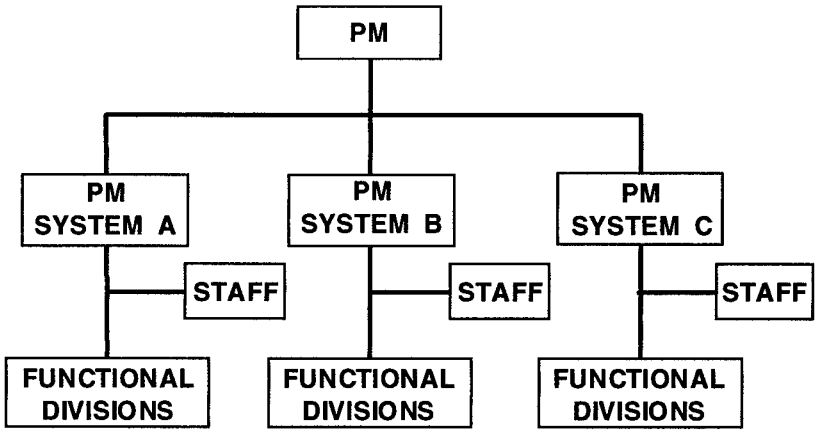
10. *Design Interface* - relationships of logistics related design parameters to readiness and support resource requirements; influence design for supportability.

PROGRAM OFFICE ORGANIZATION STRUCTURES

- ***Functional Structure***

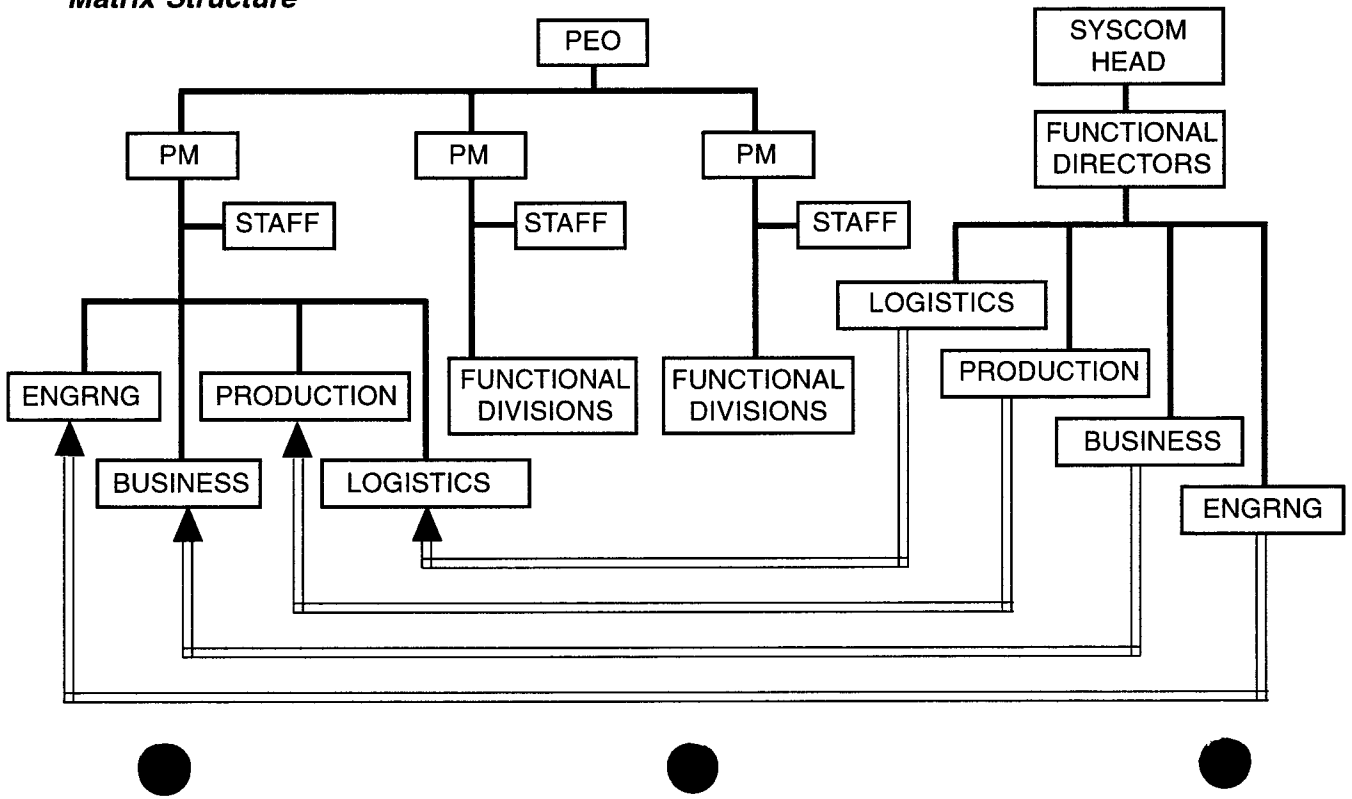


- ***Product Structure***



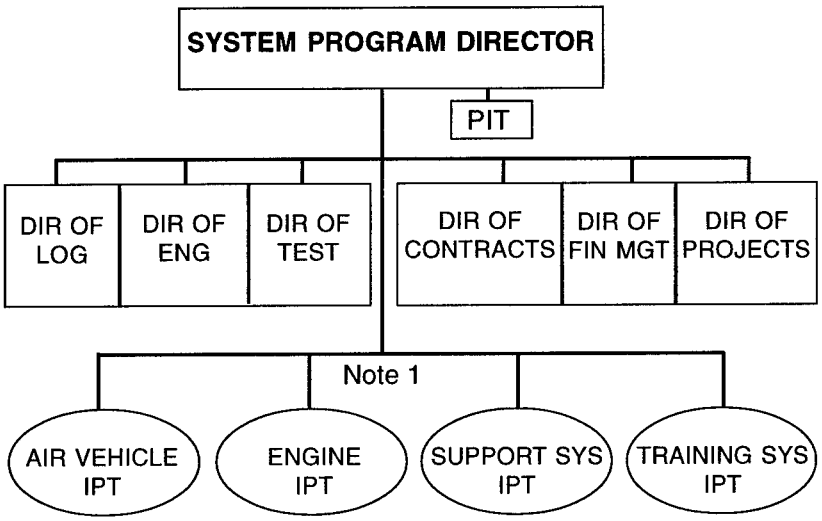
PROGRAM OFFICE ORGANIZATION STRUCTURE
(Continued)

Matrix Structure



PROGRAM OFFICE ORGANIZATION STRUCTURE
(Continued)

INTEGRATED PRODUCT TEAMS



IPT = Integrated Product Team
PIT = Program Integration Team

Note 1: IPTs mirror Work Breakdown Structure

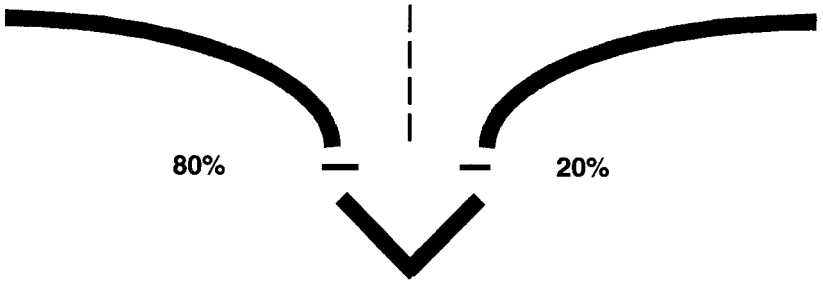
ROLE OF MANUFACTURING MANAGEMENT WITHIN THE INTEGRATED PRODUCT TEAM

DEVELOPMENT

- INFLUENCE THE DESIGN PROCESS
- PREPARE FOR PRODUCTION

PRODUCTION

- EXECUTE THE MANUFACTURING PLAN
- REFLECT DESIGN INTENT
- REPEATABLE PROCESSES
- PROCESS IMPROVEMENT



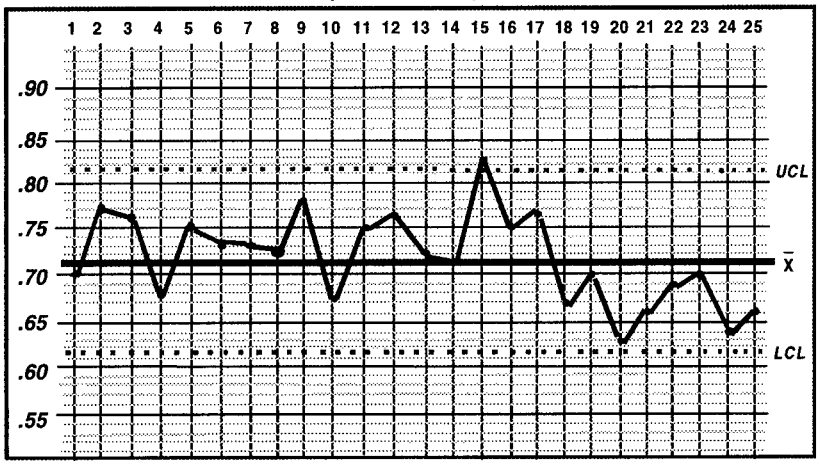
UNIFORM, DEFECT-FREE PRODUCT

- CONSISTENT PERFORMANCE
- LOWER COST

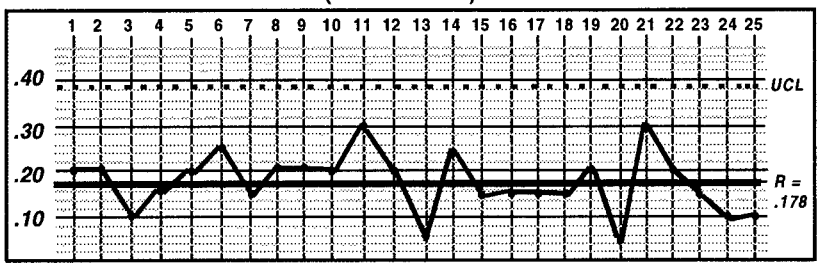
VARIABILITY CONTROL

- GOAL: Minimize and control manufacturing variation on key product characteristics
- WHY: Direct correlation between deviation from nominal value on key characteristics and product quality and functionality
- TOOLS: QFD, DOE, Process control chart (Statistical Process Control, see below)

$\bar{X}$ (Control Chart)



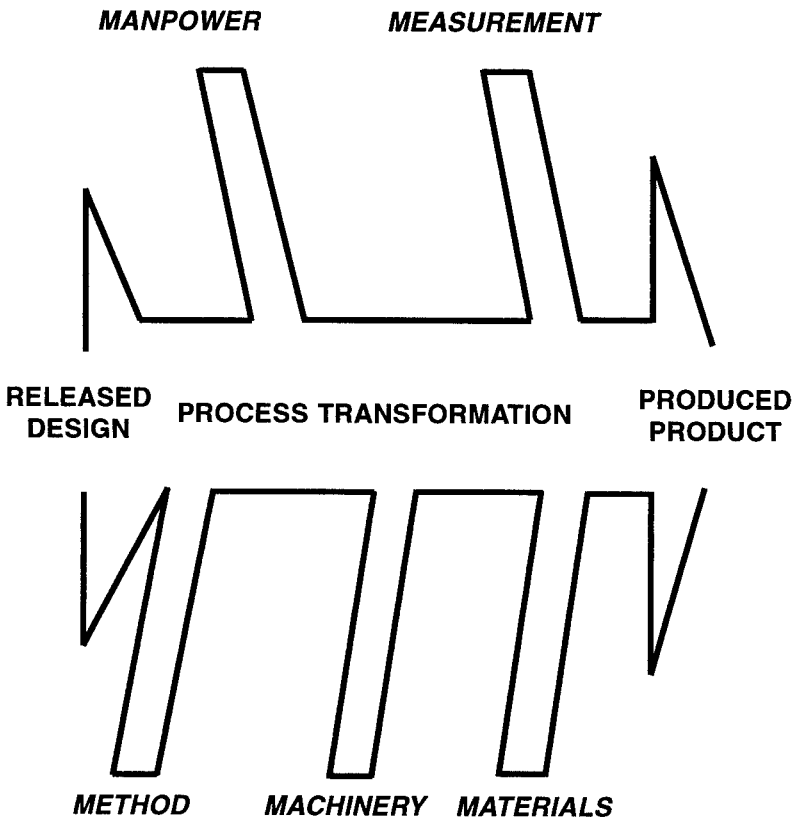
$\bar{R}$ (Control Chart)*



*Note: No lower control limit for R Chart for sample size below 7.

MANUFACTURING PROCESS ELEMENTS

THE FIVE M's



KEY MANUFACTURING QUESTIONS TO ASK Ktr REGARDING QUALITY

1. What engineering design tools are being used during development to integrate manufacturingprocesses and affordability into the design?

   Answer should include:
   - Integrated Product Teams
   - Quality Function Deployment (QFD)
     -- Disciplined process employing multifunctional processes. (What? and How to do it?)
     -- IPTs to get voice of customer into design
     -- Matches customer desires with technical solutions
     -- Technical solutions rated
   - Design for Manufacturing and Assembly (DFMA)
     -- Focuses on defining product design options for ease of fabrication and assembly
   - Design of Experiments (DOE)
     -- Identifies process factors most likely to impact quality of the end item

2. How will management determine that equitable requirements tradeoffs are made between design and manufacturing processes during development?

   Answer should include:
   - Perform producibility analysis during design of developement hardware
     -- Tradeoff design requirements against manufacturing risk, cost, production volume and existing process capability/availability

3. Of those manufacturing processes which do not exist or are unproved, what is plan to prove them out?

   Answer should include:
   - Compare program needs to work being done under DoDs Manufacturing Science and Technology Programs or individual service laboratory technology measurement program
     -- Avoid "reinventing the wheel" syndrome

KEY MANUFACTURING QUESTIONS TO ASK Ktr REGARDING QUALITY
(Continued)

- Milestone driven process development schedule which yields demonstrated process capability in factory representation environment before rate production begins

  -- Alternatives for key process considered as risk reduction if affordable

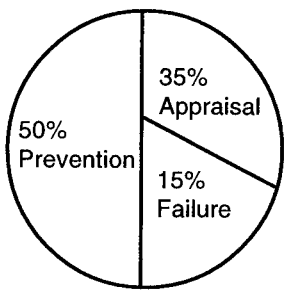
4. How does the contractor plan to insure I receive a quality product? Answer should include:

   - ISO 9000 or equivalent quality system (basic quality system) in place and consistently followed

   - Advanced Quality System (AQS) encouraged
     -- Key product characteristic identification
     -- Process/product variability control (SPC)
     -- Process capability assessment (Cp, Cpk)
     -- AQS flowdown to suppliers
     -- Integrated product development
     -- Process fool proofing (Poka-Yoke)
     -- Closed loop root cause corrective action (five whys)

5. What is your cost of quality (% if gross unit price spent on failure, appraisal, prevention)?

   World Class Company = 5-10%
   (Further breakout of 10% shown below)



TEST & EVALUATION

DT&E/OT&E COMPARISONS:

DT&E	*OT&E*
• Tech. perf. measurment	• Operational effective/suitable
• Dev. agency rsp. (PM)	• Operational Test Agency (OTA) resp .
• Technical Personnel	• 'Typical' User Personnel
• Ltd. test articles/each test	• Many test articles/each test
• Controlled environment	• 'Combat' environment
• All types of Test Articles	• 'Production Rep' Test Articles
• Contract or involved	• Contractor may not be allowed

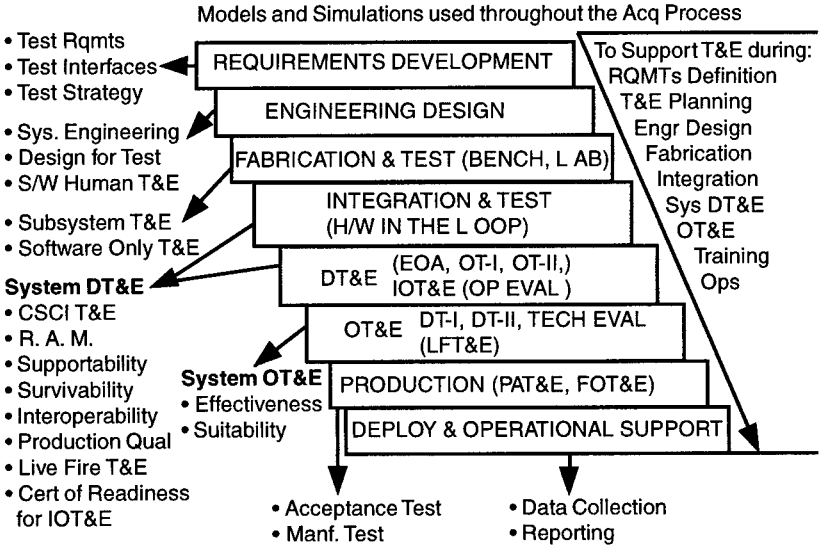
T&E Required before going Beyond Low Rate Initial Production

Production Qualification T&E - Verify Production Article meets Spec/PM responsible/ Performed by Contractor &/or Government/DPRO assistance valuable .

Live Fire T&E (LFT&E) - Vulnerability and Lethality/Dev'l Agency fund and execute . DOTE oversight, approval and congressional reporting for selected programs.

Initial Operational T&E - Operational Effectiveness and Suitability/Independent Svc OTA plan and manage. DOTE oversight, approval, and Congressional reporting for selected systems.

T&E TASKS & EVENTS



Use Combined DT/OT - single integrated DT and OT Team; combined testing; independent data analysis & reporting.

ACAT I & II Programs = require an independent, dedicated IOT&E to proceed beyond Low Rate Initial Production.

AGONIZE OVER THRESHOLDS!

Modeling & Simulation Planning Process

Establish a Program-level Simulation Working Group

PMO monitor, update, & continuously explore new opportunities

Earlier the better **- M & S Planning**

Include all Service activities with M&S expertise. Determine opportunities for M&S. throughout the program lifecycle.

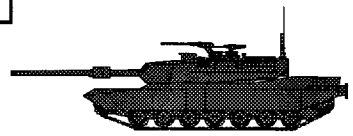
Immediately consider complete digital integrated database operation; examples:
- Boeing 777
- NSSN Attack Submarine
- Comanche.

Integral part of program planning

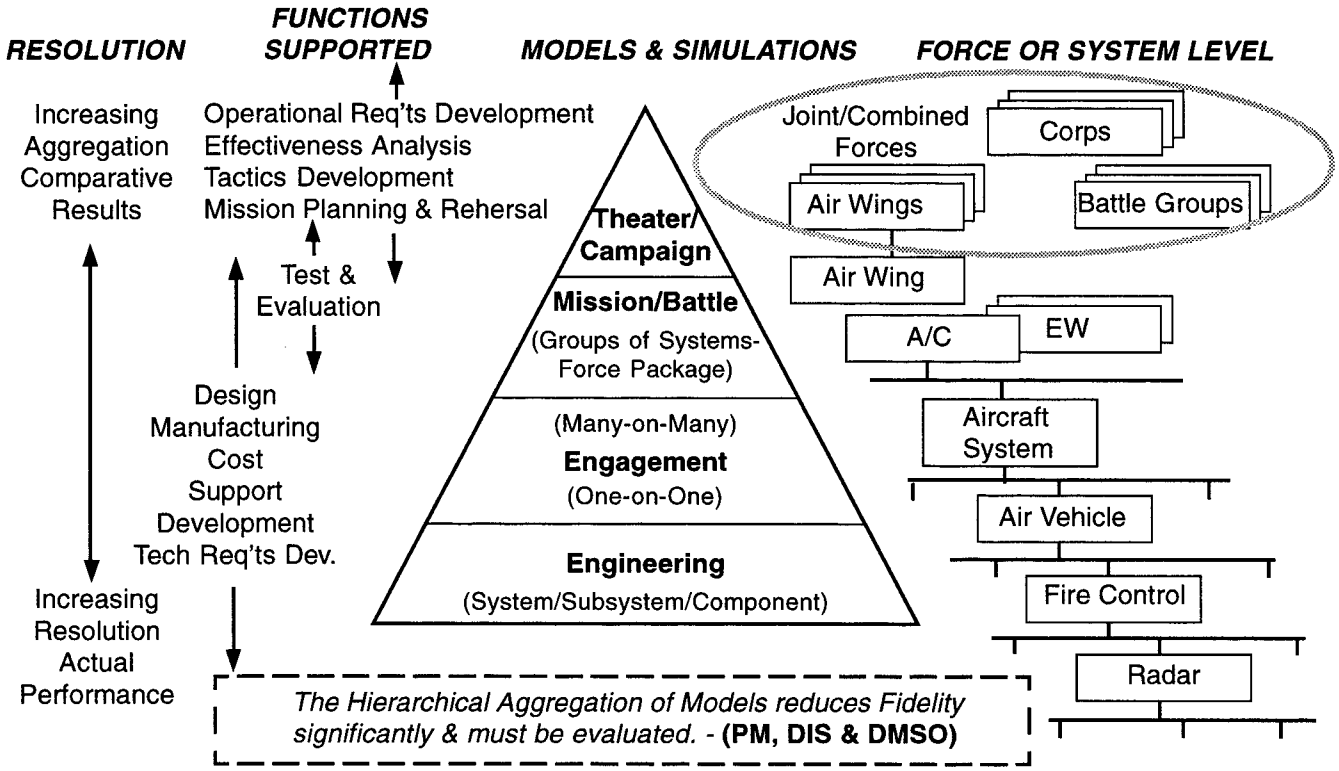
Consider:
Fidelity
Re-use
Balance
Integration
Verification
Validation
Accreditation
Scheduling
Budgets

Identify VV&A activities for all M&S.

Coordinate & document in a simulation support plan and the TEMP. Get ALL T&E organizations to support your M&S usage via formal TEMP agreement.

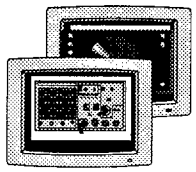


Hierarchy of Models and Simulations



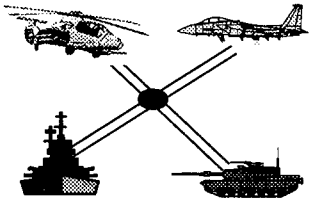
The Evolution of Modeling & Simulation

Simulation Based Acquisition is the process by which simulation is incorporated and integrated throughout the functions of the acquisition of a weapon system; from concept exploration, through prototyping and design, test and evaluation, fabrication and production, to deployment and finally operations and sustainment using an integrated database for seamless use between & by functional areas.

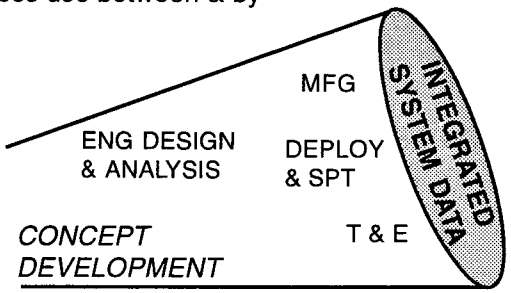


CAD
CAM
CAE

PDRR Full System Prototype



Distributed Interactive Simulation (DIS)



VIRTUAL PROTOTYPE
PHYSICAL MOCK-UP
FINAL PRODUCT

Simulation Based Acquisition

Virtual prototyping examples of different size, complexity & capability

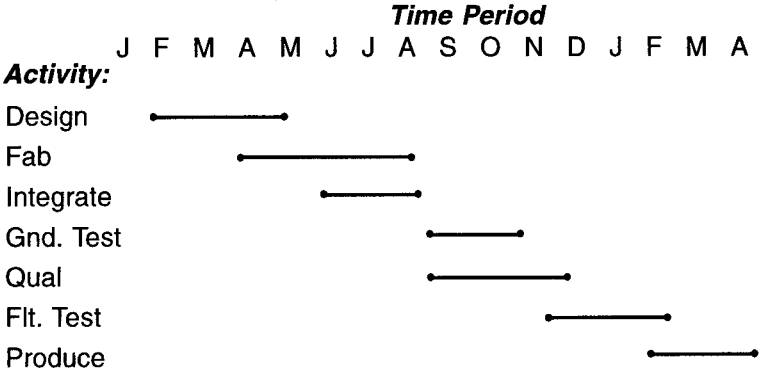
PLANNING AND CONTROL

TYPICAL TIMES FOR PROGRAM ACTIVITIES

Event	*Time (months)*
Procurement Request Development Time	6 - 9
Contract Lead-time	9 - 12
DAB Lead-time	6 - 8
PDRR Design, Fab and Test	24 - 30
EMD Design, Fab and Qual	30 - 36
Test Readiness Review Lead-time	2 - 3
DT&E	9 - 12
OT Readiness Review Lead-time	2 - 3
OT&E	6 - 12
OT Report Preparation	3
Production Lead-time	18 - 30

TYPES OF PLANING CHARTS

MILESTONE CHART (Gantt)



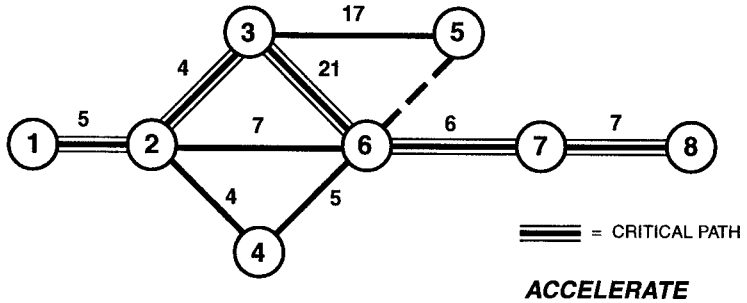
- Advantages: Simple

- Disadvantages: Difficult to show dependencies between activities unless computer constructed chart.

(ADD'L TYPES OF PLANNING CHARTS ON NEXT 5 PAGES)

PLANNING AND CONTROL
(Continued)

NETWORK CHART

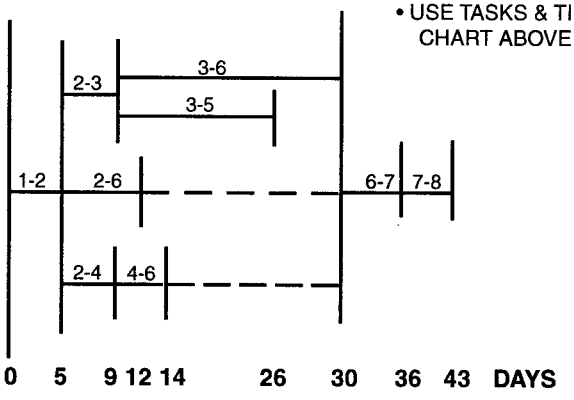


TASK	*TASK #*	*TIME*	*COST*	*ACCELERATE COST*	*ACCELERATE TIME*
Brief	1-2	5	2,200	-	5
Transport	2-3	4	15,000	500	3
Ship GFE	2-6	7	2,500	600	4
Ship system	2-4	4	4,600	750	2
Inspect	4-6	5	0	-	5
Train maint.	3-6	21	28,000	800	14
Train oper.	3-5	17	23,000	800	12
Integ. sys.	6-7	6	13,500	-	6
Dry Run	7-8	7	9,000	400	5

- Advantages: Shows dependencies; computes critical path
- Disadvantages: Complex; computerized support required to maintain
  Does not provide any chronology

SWAN CHART

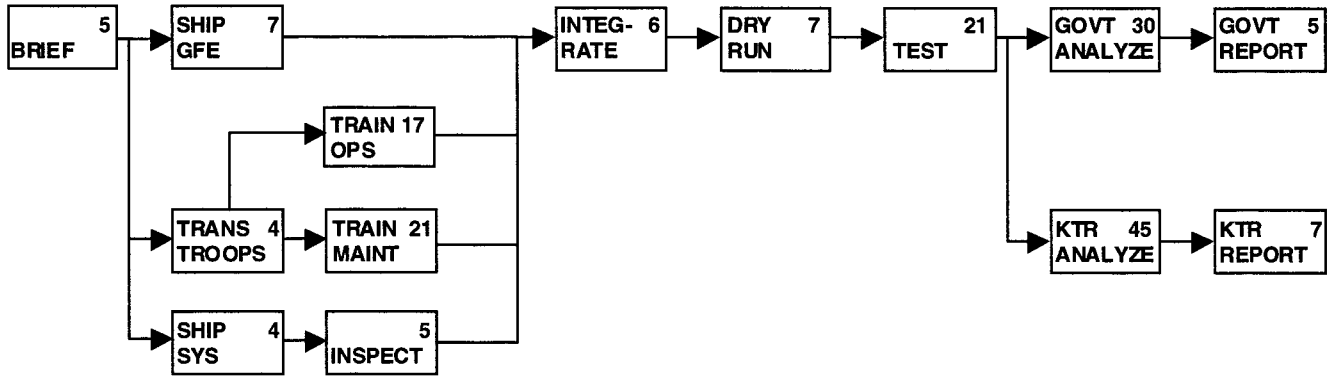
- USE TASKS & TIMES FROM CHART ABOVE



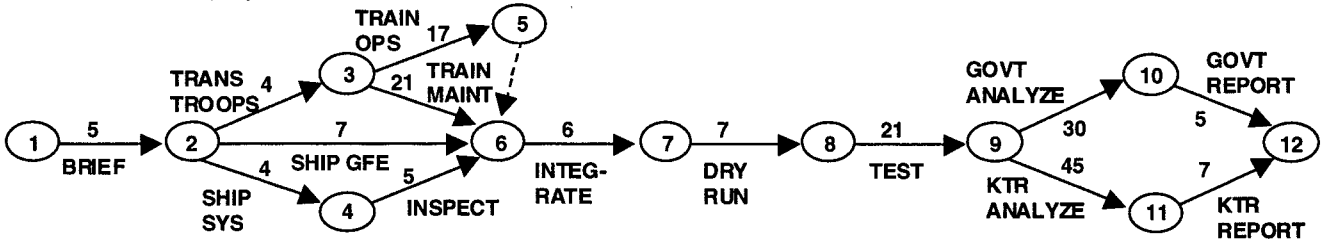
- Advantages: Shows chronology and dependencies
- Disadvantages: Complex; computerized support required to maintain

PERT* NETWORK CHARTS

Most widely-used PERT Display using scheduling software:

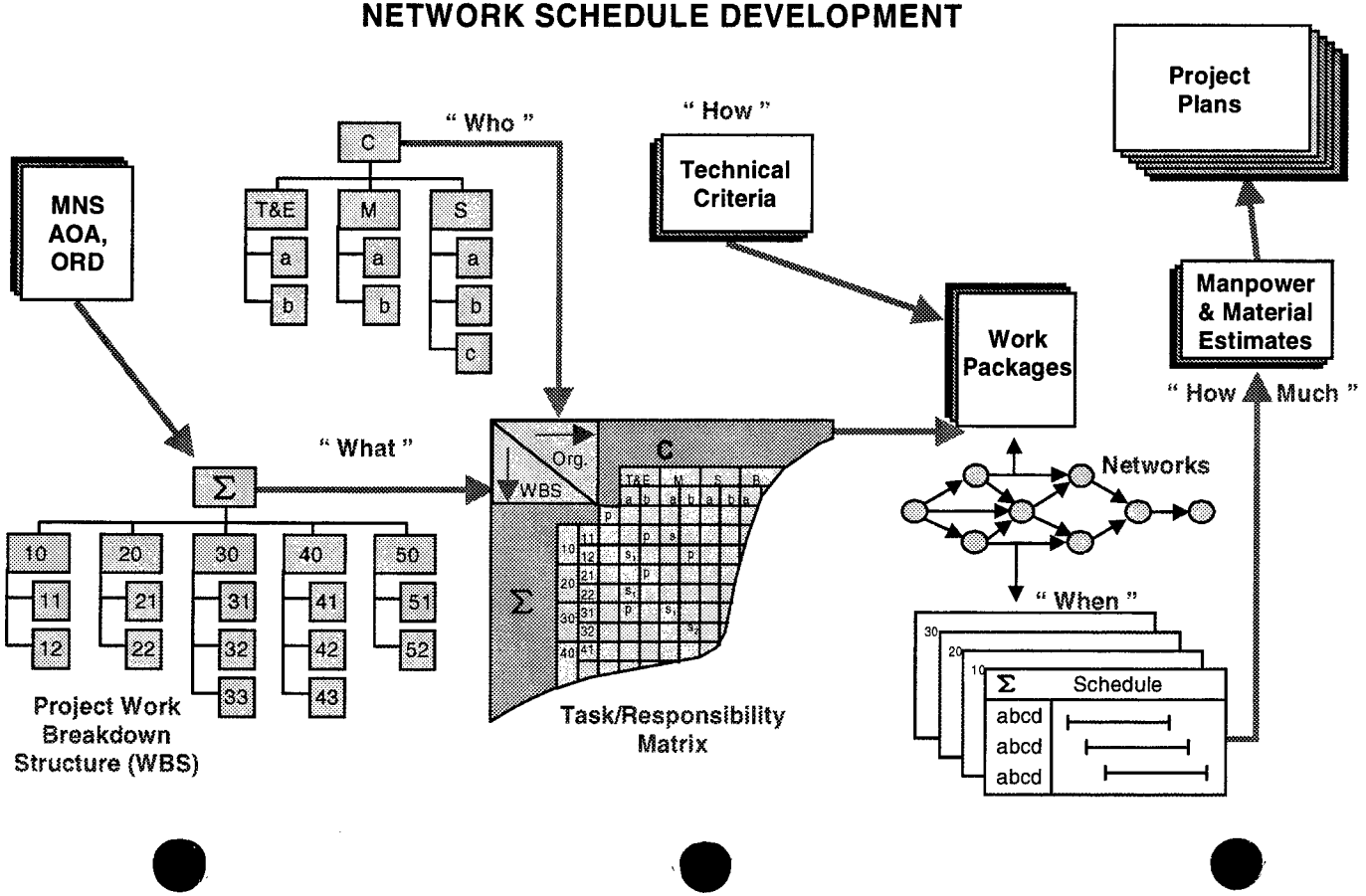


Normal PERT Display for manual method:

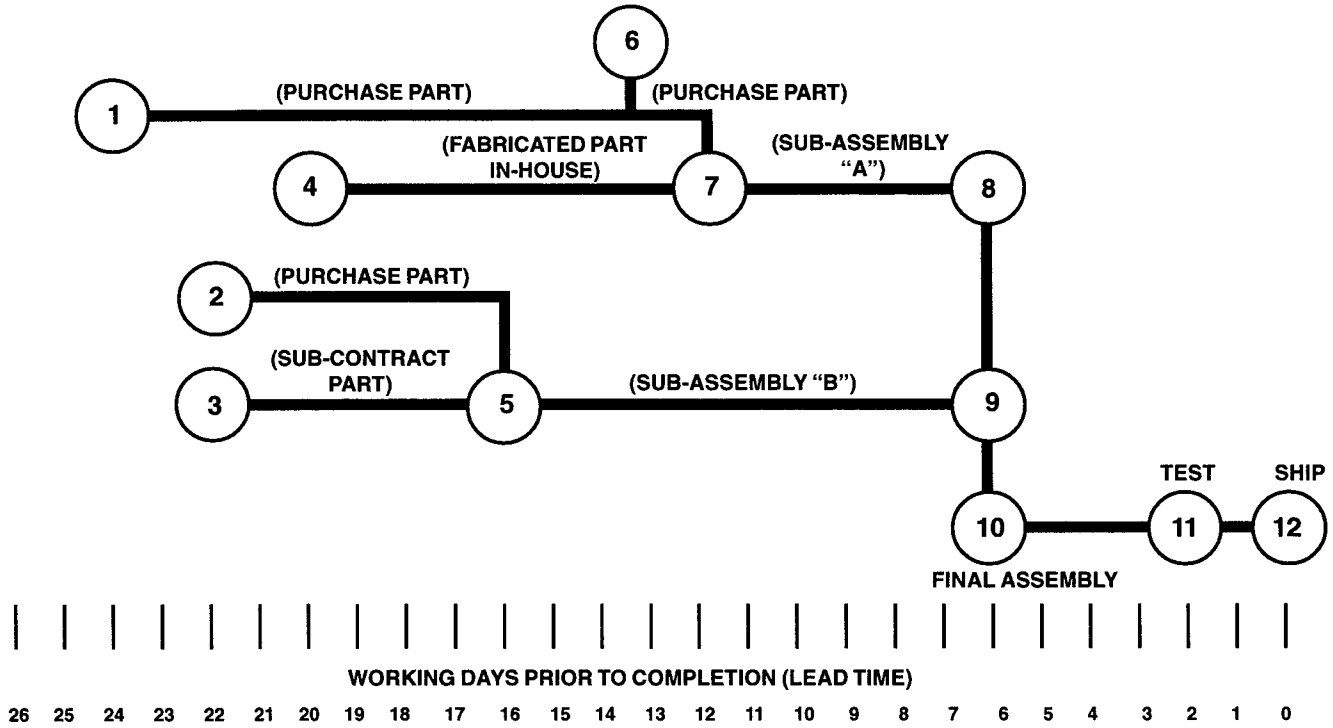


* PERT = Program Evaluation & Review Techniques

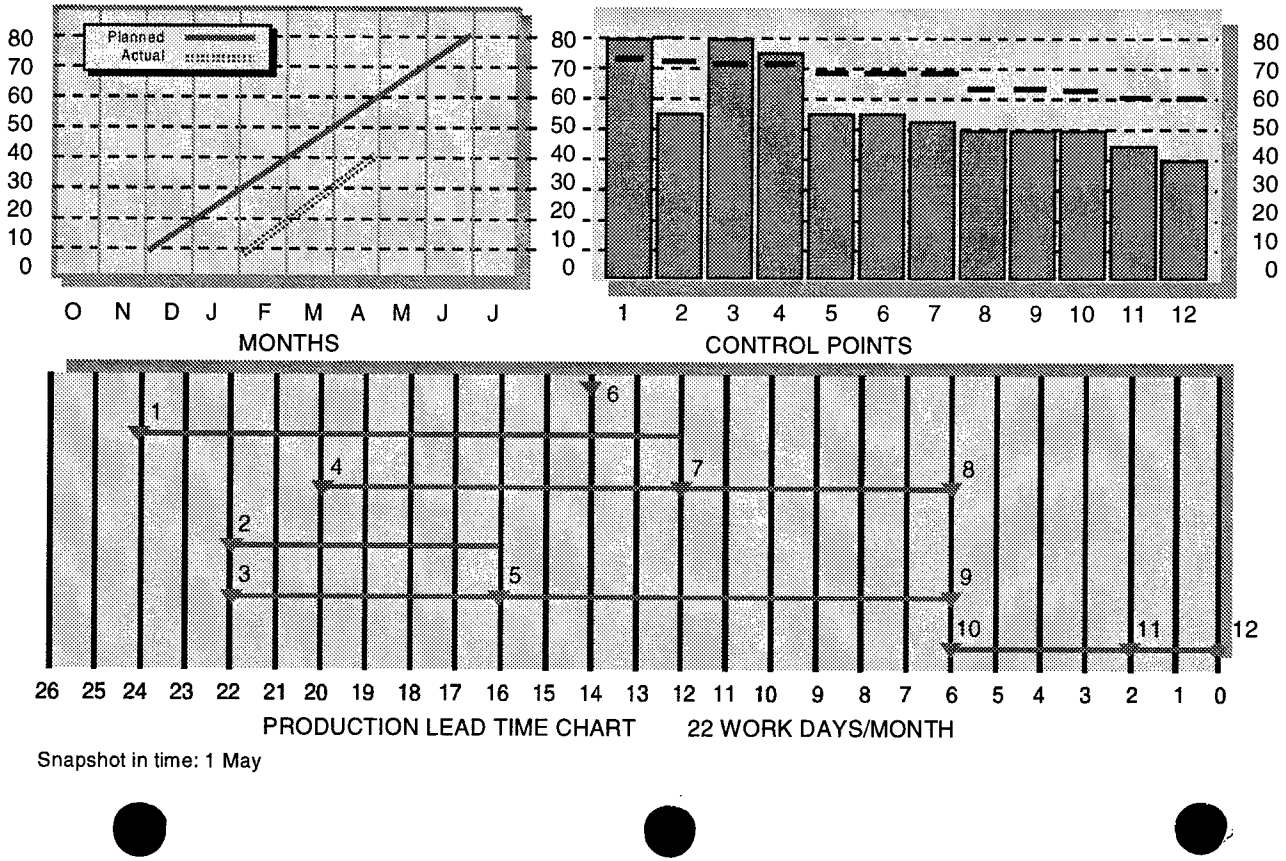
NETWORK SCHEDULE DEVELOPMENT



LEAD TIME CHART

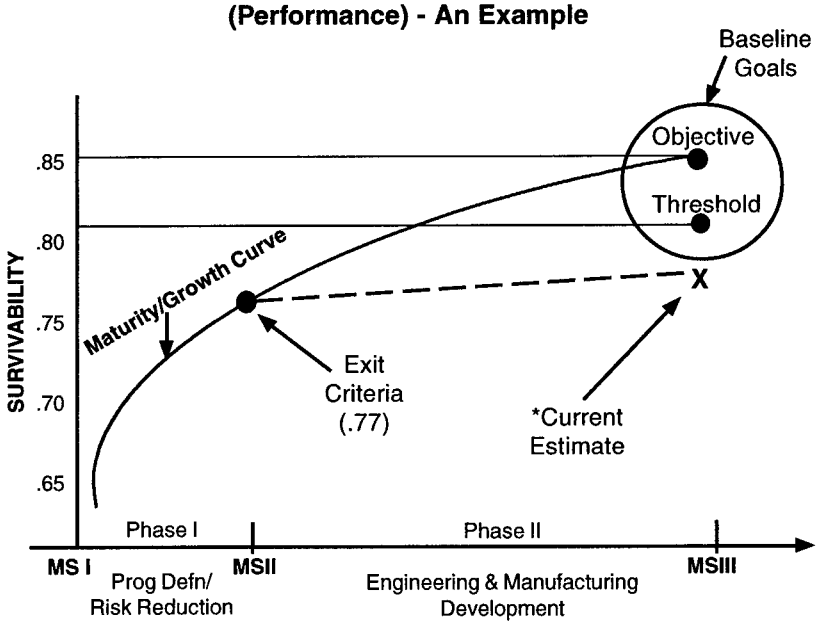


LINE OF BALANCE TECHNIQUE



Snapshot in time: 1 May

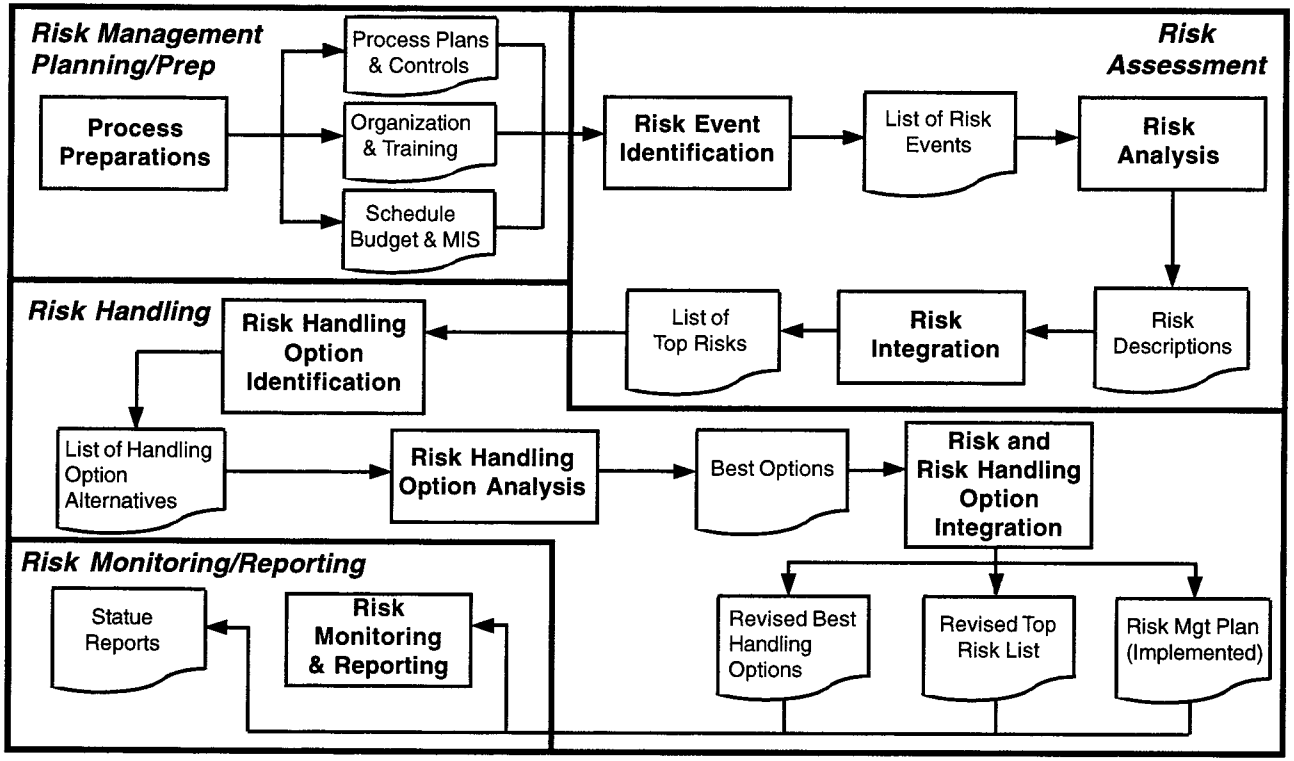
ACQUISITION PROGRAM BASELINE
(Performance) - An Example



This chart Illustrates the concept of threshhold, objective, exit criteria, and a breach based on PM's current estimate.

* Here the current estimate falls below the threshold. If probability of survivability is a KPP in the APB, this would be a performance threshold breach.

RISK MANAGEMENT PROCESS MODEL



RISK & TRADE-OFF ANALYSIS

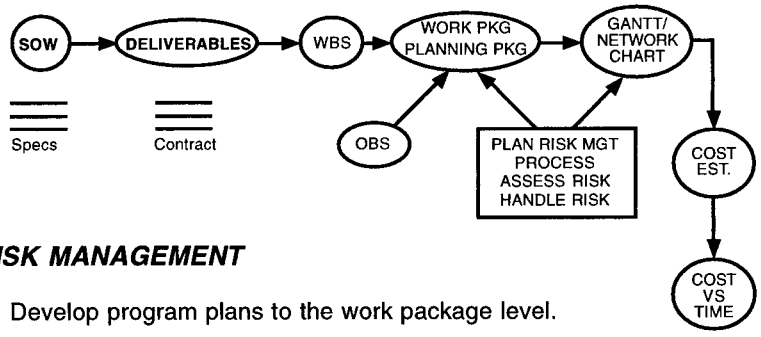
Risk Management
Risk Assessment

Risk Planning
Risk Mgmt Plan
(The Process)

Risk ID
Technical
Cost
Schedule
Lessons learned
WBS

Risk Analysis
Networks
Simulation
Watch lists
Templates

Risk Handling
Avoidance
Control
Assumption
Transfer
Research



RISK MANAGEMENT

1. Develop program plans to the work package level.
2. Assess risk at the lowest work package/WBS level.
3. Manage the highest risk work packages; most others will work out.

TRADE-OFF ANALYSIS

1. Identify alternative solutions
2. Select evaluation criteria/factors & MOEs;
   i.e. cost, schedule, performance criteria
3. Weight evaluation criteria
4. Develop utility functions for each factor
5. Conduct evaluation (weighted utility summary table where weight is multiplied by utility function value)
6. Perform sensitivity check
7. Select highest scored alternative

***With Cost As an Independent Variable (CAIV), aggressive cost objectives are established as a result of trading performance and schedule for cost.**

COST ESTIMATING

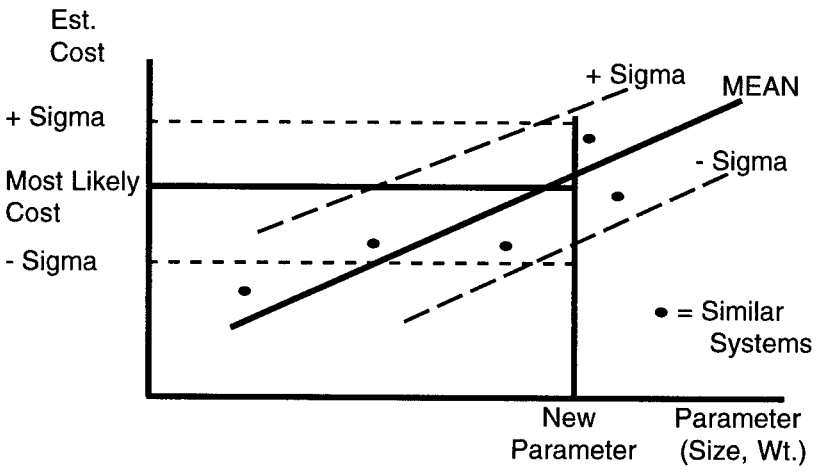
Types of Estimates

Analogy -	Comparison to existing system Little or no data available; judgmental Quick, easy, flexible Used early in CE phase
Parametric -	Analogy based on historical data Similar parameters are compared Used in CE and PDRR phases
Engineering or - Bottoms-Up	Sums very detailed analogy and parametric estimates Uses WBS structure Used mid-to-late EMD
Extrapolation -	Applies learning curve theory Based on prior actuals Used for follow-on production

Guidelines

1. Make sure cost data is relevant and homogeneous. Caution: Watch out for historical data in times of change. Prior actuals may include uncompensated overtime or were priced as a "buy-in."
2. Focus on cost drivers.
3. Test sensitivities and data relationships.

Cost Estimating Relationships (CER) - (Parametric)

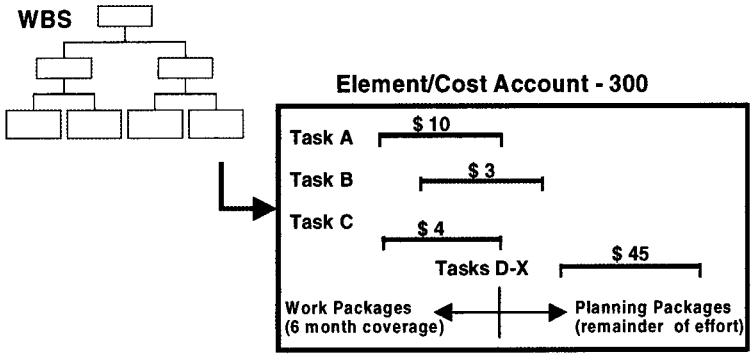


PERFORMANCE MEASUREMENT

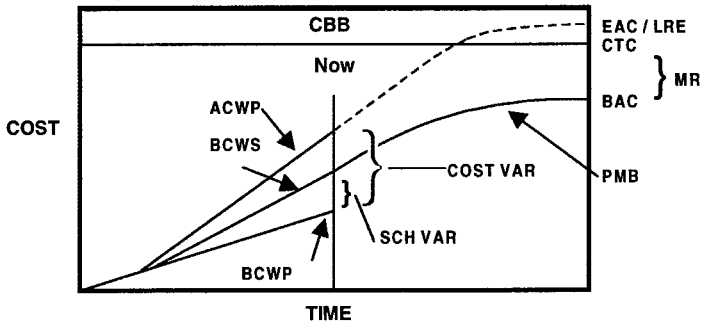
COST & SCHEDULE PERFORMANCE MEASUREMENT

1. Define the work (WBS)
2. Schedule the work
3. Allocate budgets } Cost Account Level

Defining, Planning and Budgeting



4. Prepare and monitor performance profiles



TERMINOLOGY

BCWS - Budgeted Cost of Work Scheduled
BCWP - Budgeted Cost of Work Performed
ACWP - Actual Cost of Work Performed
MR - Management Reserve
EAC - Estimate at Completion (Govt)
LRE - Latest Revised Estimate (Contractor)
BAC - Budget at Completion
CBB - Contract Budget Base(CTC+AUW)
CTC - Contract Target Cost
PMB - Performance Measurement Baseline
AUW- Auth Unpriced Work

VARIANCES

Cost Variance	CV = BCWP - ACWP
Schedule Variance	SV = BCWP - BCWS
Cost Variance %	$CV\% = \frac{BCWP - ACWP}{BCWP}$
Schedule Variance %	$SV\% = \frac{BCWP - BCWS}{BCWS}$
Variance at Completion	VAC = BAC - EAC

PERFORMANCE MEASUREMENT
(Continued)

PERFORMANCE INDICES

Cost Performance Index CPI = $\frac{BCWP}{ACWP}$

Schedule Performance Index SPI = $\frac{BCWP}{BCWS}$

Percent Complete = $\frac{BCWP\ (cum)}{BAC}$

Percent Spent = $\frac{ACWP\ (cum)}{BAC}$

ESTIMATE AT COMPLETION

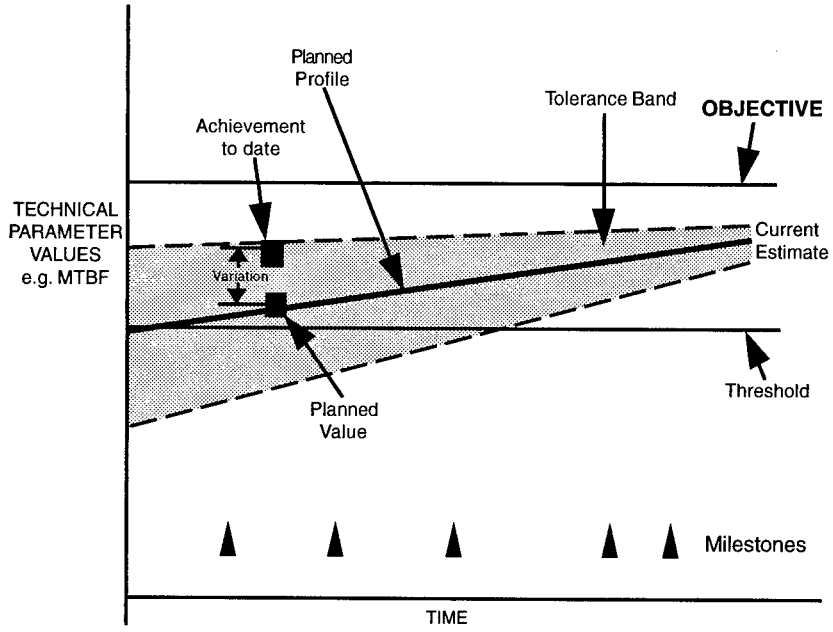
EAC (Lowest Est.) = $\frac{BAC}{CPI(cum)}$

EAC (Highest Est.) = $ACWP(cum) + \frac{BAC - BCWP(cum)}{\{CPI(cum) * SPI(cum)\}}$

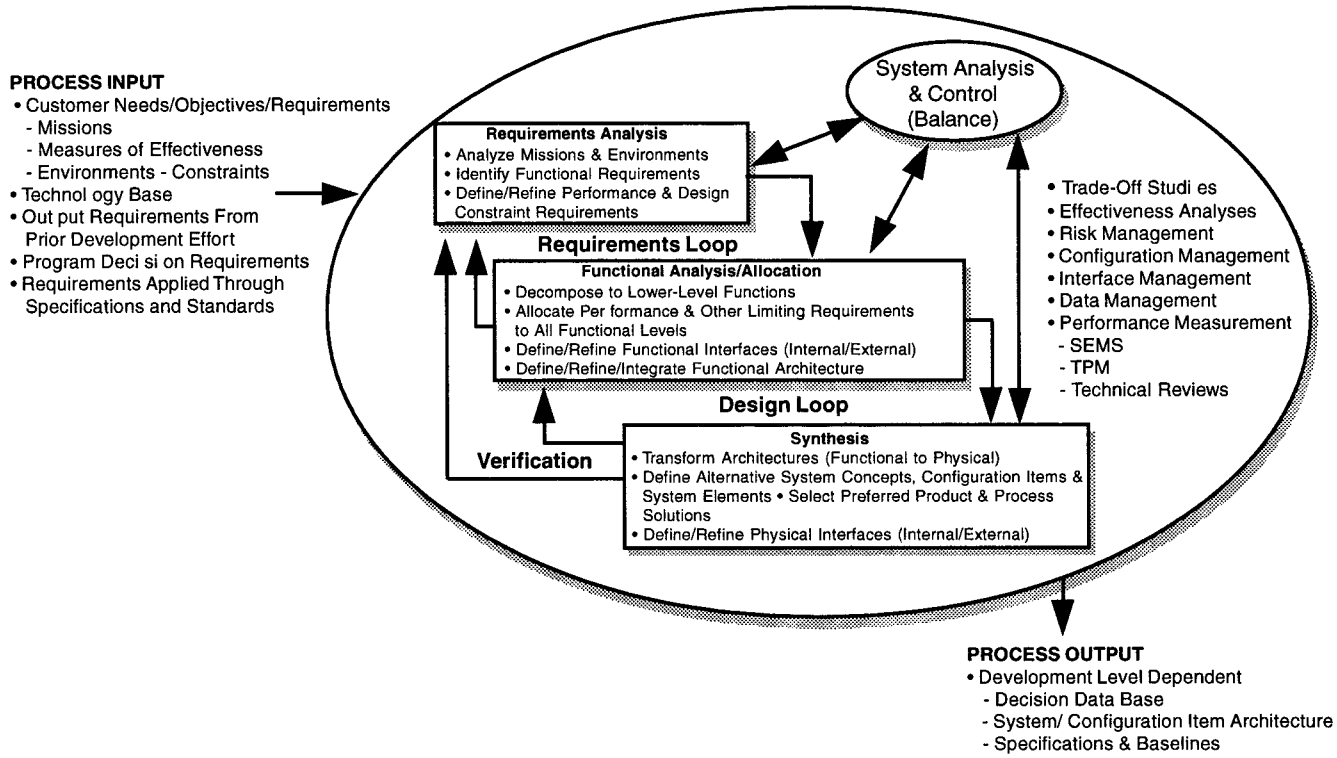
TO COMP PERFORMANCE INDICES

$TCPI(EAC) = \frac{BAC - BCWP(cum)}{BAC - ACWP(cum)}$

TECHNICAL PERFORMANCE MEASUREMENT
THE CONCEPT



Systems Engineering Process



REQUIREMENTS ANALYSIS QUESTIONS

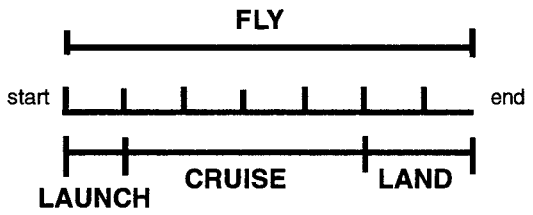
- What are the **reasons** behind the system development?
- What are the customer **expectations**?
- **Who** are the users and how do they **intend to use** the product?
- What do the users **expect** of the product?
- What are their level of **expertise**?
- What **environmental** characteristics does the system have to comply with?

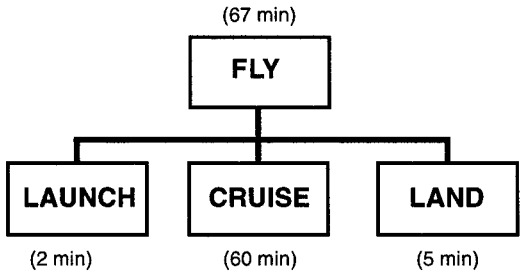
(System Engineer)

(User/Warfighters)

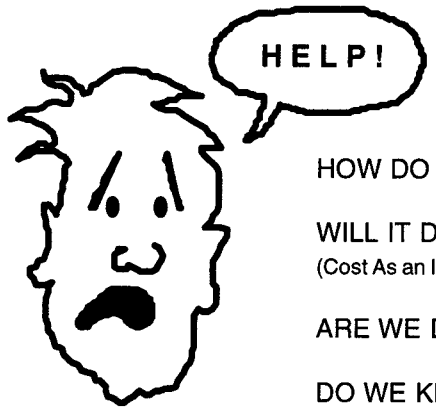
Functional Analysis/Allocation

- Allocate Functions
  - Decompose Higher Functions
- Allocate Performance
  - From Higher to Lower Functions
- Functional Descriptions
  - Functional Flow Block Diagrams
  - Time Line Analysis
  - Functional Architecture





SYSTEMS ANALYSIS AND CONTROL
(MGMT TOOLS)



HOW DO I MAKE DECISIONS ? → TRADE STUDIES

WILL IT DO JOB/WORTH THE $$? → EFFECTIVENESS ANALYSIS
(Cost As an Independent Variable (CAIV))

ARE WE DOING THE RIGHT THING ? → RISK MGMT

DO WE KNOW WHAT WE HAVE ? → CONGFIG MGMT

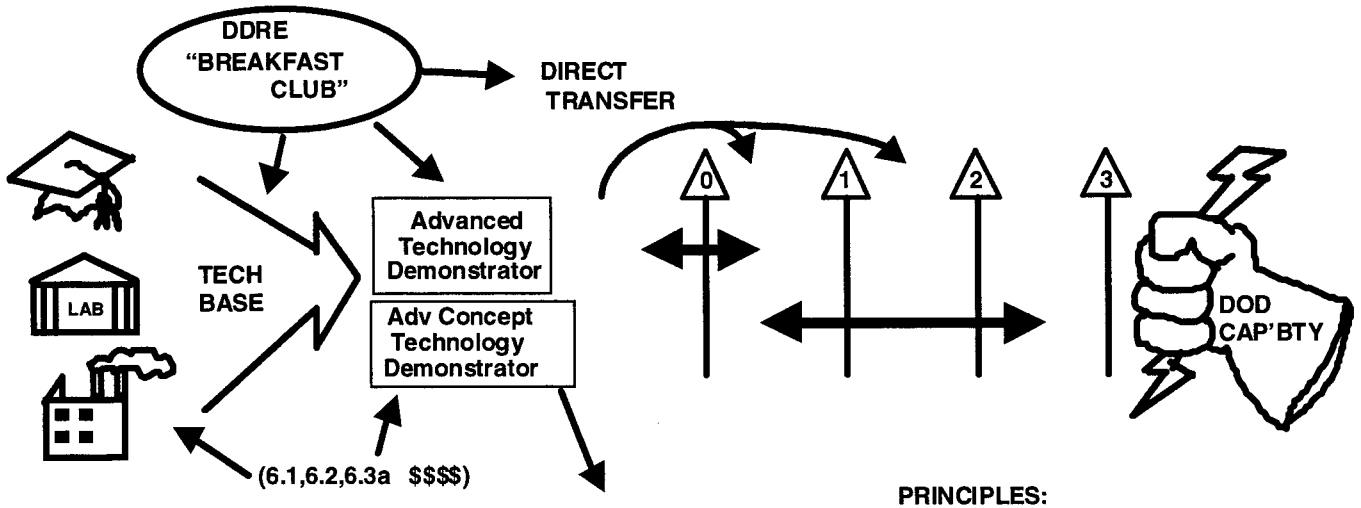
WILL IT ALL WORK TOGETHER ? → TECH PERF MEAS

WHAT SHOULD THE CONTRACTOR BE DOING ? → STATEMENT OF WORK

ARE WE READY TO GO ON ? → TECH REVIEWS

HOW DO I RUN THIS PROGRAM ? → SYS ENGR PLANNING

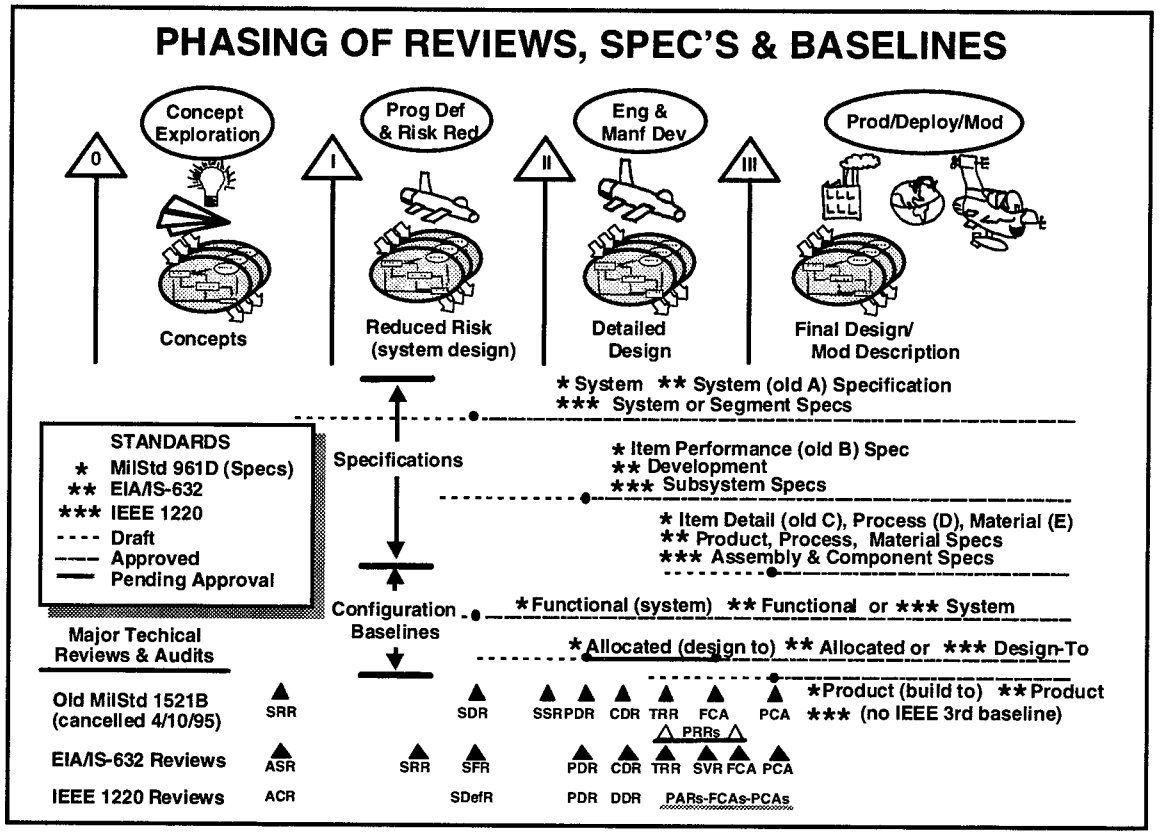
New Science & Technology (S&T) Strategy



DUAL USE, COMMERCIAL APPLICATIONS

PRINCIPLES:

1- WARRIOR NEEDS
2- LOWER COSTS
3- SPT MIL-COMM IND BASE
4- PROMO RESEARCH
5- QUALITY


PHASING OF REVIEWS, SPEC'S & BASELINES
Concept Exploration
Prog Def & Risk Red
Eng & Manf Dev
Prod/Deploy/Mod
0
I
II
III
Concepts
Reduced Risk (system design)
Detailed Design
Final Design/ Mod Description
* System ** System (old A) Specification
*** System or Segment Specs
STANDARDS
* MilStd 961D (Specs)
** EIA/IS-632
*** IEEE 1220
---- Draft
—— Approved
—— Pending Approval
Specifications
* Item Performance (old B) Spec
** Development
*** Subsystem Specs
* Item Detail (old C), Process (D), Material (E)
** Product, Process, Material Specs
*** Assembly & Component Specs
Configuration Baselines
*Functional (system) ** Functional or *** System
*Allocated (design to) ** Allocated or *** Design-To
*Product (build to) **Product
*** (no IEEE 3rd baseline)
Major Techical Reviews & Audits
Old MilStd 1521B (cancelled 4/10/95)
SRR SDR SSR PDR CDR TRR FCA PCA
PRRs
EIA/IS-632 Reviews
ASR SRR SFR PDR CDR TRR SVR FCA PCA
IEEE 1220 Reviews
ACR SDefR PDR DDR PARs-FCAs-PCAs

SPECIFICATIONS AND STANDARDS

A New Way of Doing Business (Acquisition Reform)
(Sec Def Memo of 29 June 1994)

1. Use **Performance**-Based Specifications

2. Cancel/**Convert** Manufacturing and Management Standards to **Performance** or Nongovernment Standards (NGSs)

3. Encourage Contractors to Submit **Alternative Solutions** to Military Standards/Specifications

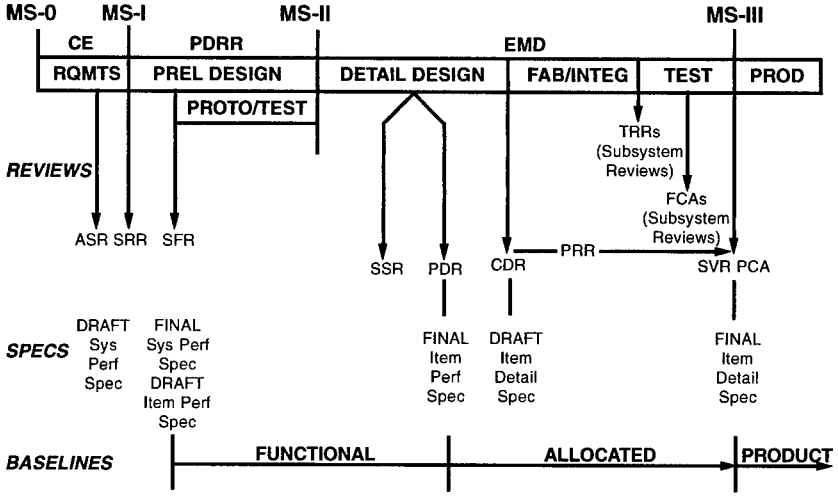
4. **Prohibit** Use of Military or commercial Specifications/Standards in Contract **Except** when **Authorized** by SAE or Designee

SPECS, REVIEWS, AUDITS & CM

SPECIFICATIONS

TYPE	WHEN	APPR	BASELINE
System	PDRR	SFR	Functional
Item Perf	PDRR	PDR (HW) SSR (S/W)	Allocated
Item Detail	EMD	PCA	Product
Process	EMD	PCA	Product
Material	EMD	PCA	Product

REVIEWS, SPECS, BASELINES AND AUDITS



SYSTEM REVIEW DEFINITIONS *(Based on EIA Interim Std (IS) 632)*

ASR - Alternative Systems Review - Preferred System Solution meets needs

SRR - Systems Requirements Review - Preliminary functional requirements

SFR - Systems Functional Review
- Approve functional requirements
- Preliminary allocated requirements reviewed

SSR - Software Specification Review
- Approve S/W allocated requirements
- Establish S/W allocated baseline

Note: EIA Interim Std (IS) 632 deletes use of "A", "B", "C", "D", and "E" designators

SPECS, REVIEWS, AUDITS & CM
(Continued)

DEFINITIONS (Continued)

PDR - Preliminary Design Review	- Approve H/W allocated requirements - Establish H/W allocated baselines
CDR - Critical Design Review	- Preliminary product requirements - Ready for fabrication
PRR - Production Readiness Review	- Assess producibility/manuf. readiness - Assess test readiness
TRR - Test Readiness Reviews	- Approve test plans
FCA - Functional Configuration Audits	- Verify CIs perform to spec
SVR - System Verification Review	- Verify CIs perform as "system"
PCA - Physical Configuration Audit	- Verify CIs "as built" documentation

CONFIGURATION MANAGEMENT

Four functions:

1. Configuration Identification - family of specs and drawings that describes the system or configuration item (CI)

2. Configuration Control - managment of changes to a CI via the configuration control board (CCB)

3. Configuration Status Accounting - managment information system that provides traceability of configuration ID and changes thereto

4. Configuration Audits - validate development requirements are achieved and tech documentation is complete and accurate

Engineering change - alteration in the approved configuration ID of a CI

Two types - Class I: proposed change affecting established CI baselines, supportability, interoperability or contractual factors.

- Class II: All other engineering changes

SOFTWARE MANAGEMENT

- Nine Principle Best Practices to Improve Software Development, Reduce Costs, and Increase User Satisfaction*

  - Formal Risk Management
  - Agreement Interfaces
  - Peer Reviews/Inspections/Walk-throughs
  - Metric-Based Scheduling and Management
  - Binary Quality Gate, at Inch-Pebble Level
  - Program-wide Visibility of Project Progress vs. Plan
  - Defect Tracking Against Quality Targets
  - Configuration Management
  - People-Aware Management Accountability

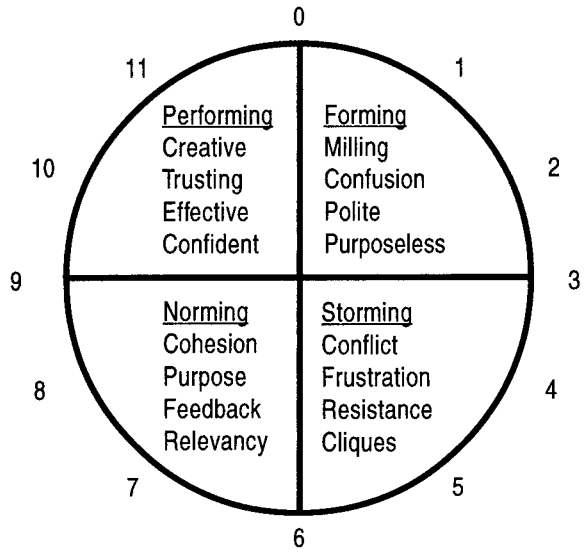
- Nine Project "Breathalyzer " Questions to provide "Quick Look" at Software Project Health**

  - Do you have a current, credible activity network supported by a work breakdown structure (WBS)?
  - Do you have a current, credible schedule and budget?
  - Do you know what software you are responsible for delivering?
  - Can you list the current top 10 project risks?
  - Do you know your schedule compression percentage?
  - What is the estimated size of your software deliverable? How was it derived?
  - Do you know the percentage of external interfaces that are not under your control?
  - Does your staff have sufficient expertise in the project domains?
  - Have you identified adequate staff to allocate to the scheduled tasks at the right time?

**"Little Yellow Book of Software Management Questions" (Software Program Managers Network)
***"Project Breathalizer Questionnaire Software Health"; Software Program Managers Council

WORKING GROUPS

TEAM DEVELOPMENT WHEEL



RECOGNIZE WHICH PHASE OF TEAM DEVELOPMENT YOU ARE IN AND TAKE POSITIVE ACTION TO WORK THROUGH

TYPICAL WORKING GROUPS

- Logistics Support Management Team (LSMT)
- Test & Evaluation Working Group (TEWG)
- Computer Resources Working Group (CRWG)
- Requirement Interface Working Group
- Interface Control Working Group (ICWG)
- Technology Assessment Working Group
- "Tiger" Team
- Process Action Team
- Integrated Product & Process Teams

WORKING GROUPS
(Continued)

Group Consensus - all group members must accept a solution and live with the consequences. Until you have this agreement, you don't have consensus. Guidelines for achieving:

1. Avoid arguing for your own opinion.
2. Go for "win-win" solutions.
3. Do not change mind to avoid conflict.
4. Avoid majority vote, coin-flipping, horse-trading.
5. Expect differences of opinion.

MANAGEMENT TRADE-OFFS FOR WORKING GROUPS

Advantages	*Disadvantages*
• More ideas & solutions	• Takes more time
• Consensus positions	• Hard to terminate
• Strong commitments	• Paralysis by analysis

//
MANAGERIAL SKILLS

• More things that make you go "Hmmm?... "

"An authority is a person who just happens to know the source."

"A conservative is a person who believes nothing should be done the first time."

"Diplomacy is the art of hearing all parties arguing in a dispute and nodding to all of them without ever agreeing with any of them."

"The meeting raised our confidence that the contractor can actually accomplish the task and that it will occur in our lifetime."

"This is the earliest I've been late."

"The world would be a much better place if people weren't allowed to have children until they've proven they can successfully manage a DoD program."

DELEGATION

REASONS FOR DELEGATING

1. Improve manager's time management
    a. Increase manager's span of control
    b. Increase time allocated to long range planning
    c. Increased management efficiency
2. Assure tasks performed by most qualified
3. Build organizational depth
4. Improve employee motivation
5. Increased teamwork (IPTs/TQM)
6. Maximize resources
7. Appropriate organizational responsibility

12 STEPS FOR DELEGATING

1. Set clear objectives and task statements
2. Select "Delegate"; check qualifications
3. Provide training, if necessary
4. Solicit input from Delegate
5. Assign task and deadline
6. Provide any relevant guidance
    a. Critical information required to do tasks right
    b. Potential approaches - only as suggestions!
    c. Describe results desired
7. Makes a delegation "contract" (see next page)
8. Establish controls
9. Maintain controls
10. Provide feedback
11. Identify lessons learned
12. Evaluate performance

DELEGATION STATUS FILE

3 File Sections to hold all delegation records

I. Current Month
    - Sectioned for 31 calendar days
    - File delegation records by suspense month

II. Remaining 11 months
    - Section for each month
    - File delegation records by suspense month

III. Completed Records
    - File alphabetically by Delegate name
    - Use data for performance evaluations

DELEGATION
(Continued)

DELEGATION RECORD	
Description of Action:	Date:
Person Assigned:	
Authority Level (specify): 1 - Take action; do not report back 2 - Take action; report back (see Frequency) 3 - Prepare plan; proceed upon approval 4 - Do only as directed below	*Frequency of Contact (specify):* 1 - daily 2 - weekly 3 - monthly 4 - other _____
Delegation Guidance/Agreements:	
Suspense Action:	Suspense Date:
Performance Assessment:	

EFFECTIVE MEETINGS

PRE-MEETING

A. Establish type of meeting
   1. Information (quick, crisp)
   2. Planning/Strategizing (slow, deliberate)
   3. Problem solving (divergent/convergent)
   4. Decision (deliberate)
   5. Staff/Conference (repetitive, short)
   6. Feedback/Evaluation (slow, contemplative)
   7. Training (smooth, flowing)
   8. Social (rambling)

B. Select participants
   1. Based on purpose; relevant; decision auth.
   2. Size: 4-7 ideal; 10-12 tolerable; >13 unsat.

C. Circulate agenda (3-5 days in advance)
   1. Type, purpose, date, place, start/finish times
   2. Topics, time allocated (minutes), speakers
   3. Assign recorder

CONDUCTING MEETING

A. Opening
   1. Start on time
   2. Repeat type and purpose of meeting

B. During
   1. Facilitate the meeting
   2. Encourage openness and communication
   3. Develop cohesion
   4. Use active listening
   5. Stick to agenda

C. Closing
   1. Set time and date of next meeting
   2. Summarize agreements, actions, decisions
   3. Close on time or before

AFTER MEETING

A. Review minutes with recorder
B. Publish minutes

TOTAL QUALITY MANAGEMENT

Quality: consistent conformance to customer expectations

Seven Elements of Total Quality

1. Customer Focus - who they are and what they expect
2. Systems Perspective - the org. is a system with technical and social aspects
3. Process Management - understand processes to provide needs of the customer
4. Continuous Improvement - if it ain't perfect yet, improve it!
5. Individual Involvement - people who do and understand work must be involved
6. Teamwork - coordination of effort to produce timely, quality product
7. Leadership Commitment - leaders at all levels focused on total quality

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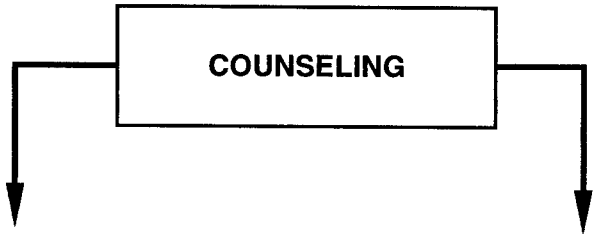
Deming's Fourteen Obligations of Top Management

1. Create constancy of purpose for improvement of product and service.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on the basis of price tag alone. Instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production, and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the work force.
11. Eliminate numerical quotas for the work force and numerical goals of management.
12. Remover barriers that rob people of pride of workmanship. Eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.
14. Put everybody in the company to work to accomplish the transformation.

PERSONAL COMMUNICATIONS



DIRECTIVE
- Give advice
- Evaluate
- Motivate
- Explain
- Reassure

Advantages
- Effective with inexperienced personnel
- Quick
- Take charge attitude

Disadvantages
- Perceived insulting
- Does not support delegation
- Manager keeps responsibility

NON-DIRECTIVE
- Don't display authority
- Listen carefully
- Don't advise
- Facts only; no opinions
- Employee find solution

Advantages
- Develops commitment
- Good training
- Employee responsible
- Supports delegation

Disadvantages
- Takes time
- Skill/patience required
- Ineffective with inexperienced personnel

COUNSELING PROCESS

1. Set up interview - private, confidential, unhurried
2. Encourage discussion - open questions, active listening
3. Help employee think it through - deal with facts, no opinions or own views
4. Let them find the solution - *their* solution to *their* problem

PERSONAL COMMUNICATIONS
(Continued)

WIN-WIN NEGOTIATIONS

FOCUS: Defeat the problem; not the person

APPROACH:
- Resolve conflict
- Reach agreement
- Normalize relationships
- Combine efforts

GOAL:
- Acceptable gains by both parties

INTER-PERSONAL NEGOTIATIONS

1. Separate people and emotions from the problem

2. Focus on interests, not positions

3. Generate options for mutual gain

4. Insist on objective criteria

PROBLEM SOLVING

CREATIVE PROBLEM SOLVING

1. List perceived problems
2. Gather relevant data
3. Define actual problem
4. Determine alternative solutions
5. Analyst and evaluate alternatives
6. Select solution
7. Validate solution

*DIVERGENT THINKING**

1. Accept all ideas and alternatives
2. Defer judgement or evaluation
3. Discuss, combine, hitchhike, improve ideas
4. When exhausted, move to converge

*CONVERGENT THINKING**

1. Establish categories of alternatives
2. Develop evaluation criteria
3. Avoid premature closure
4. Keep eye on objective
5. List strengths and weaknesses
6. Select best alternative or idea

*Used sequentially during all problem-solving steps

PROBLEM SOLVING
(Continued)

QUALITATIVE PROBLEM SOLVING
(Kepner - Tregoe)1/

Deviation Statement: (Describe the actual performance vs should performance)

	Is	Is Not	What is distinctive about "Is" *vs* "Is Not"?	Does the distinction suggest a change?
Specifying Question What? (Identify) Where? (Location) When? (Timing) Extent? (Magnitude)				
Possible Causes:				
Most Likely Cause:				

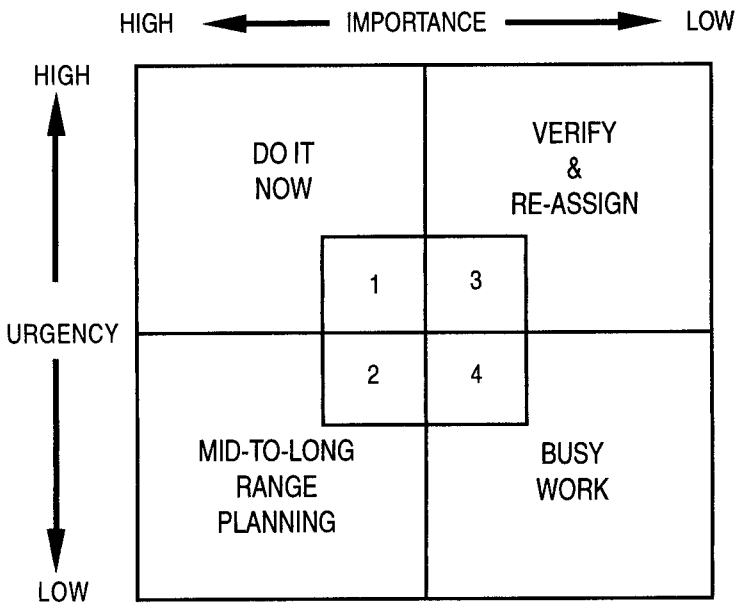
1. Define deviation.
2. Describe what deviation IS and IS NOT.
3. List distinctions between what deviation IS and IS NOT.
4. Do distinctions indicate or suggest a change?
5. Determine possible causes based on distinctions and changes.

TIME MANAGEMENT

TIME ROBBERS AND AVOIDANCE TECHNIQUES

1. Incoming telephone calls	- screen for importance - limit to 2 minutes
2. Outgoing telephone calls	- do all at one time - itemize topics before calling - don't socialize
3. Unscheduled visitors	- screen for importance - do not invite into office - remain standing
4. Improper delegation	- re-delegate
5. Poorly conducted meetings	- stay focused on subject area and on schedule

TIME MANAGEMENT
(Continued)



1. List all tasks.
2. Categorize tasks using matrix.
3. Review quadrant 3 items; re-assign as 1, 2, or 4 as appropriate.
4. Do quadrant 1 tasks first; consider delegating!
5. Strive to maximize time for quadrant 2 tasks (be proactive!).
6. When all 1 and 2 tasks are complete, do quadrant 4 tasks.

KEEP A "TO DO" LIST

1. List all goals and tasks.
2. Categorize as A - High value
   B - Medium value
   C - Low value
3. Prioritize within each category (e.g. A-1, A-2, etc.).
4. Accomplish all A tasks, then all B. Do C if time permits.
5. Review list and priorities daily.

BRAINSTORMING

PURPOSE: To stimulate the free flow of ideas.

METHOD: Group members take turns generating ideas. One idea stimulates another and then another. Freewheeling of ideas is encouraged. Brainstorming stops when all group members run out of ideas. See the back of this page for questions that may suggest new ideas for you.

GROUND RULES:

Put judgment aside. Remember, all ideas can be thought of as starters.

No criticism allowed. This is not the time to judge an idea. Don't criticize other ideas no matter how ridiculous they may seem. The ideas can be discussed in detail later; now, the objective is to generate more ideas.

Welcome free-wheeling or blue-skying. Let those wild ideas come out—otherwise you may conceal your creative process. The impractical ideas may trigger other ideas that are possible to use.

Strive for quantity, not quality. The more ideas brought out, the better the chance of a great solution.

Combine and rearrange ideas. Single ideas aren't the only way to make a suggestion. You can make additions or combinations of previously suggested ideas to create still better ideas.

Record all ideas exactly as expressed. This keeps the mind free of remembering what was said and allows you to build on previous ideas.

BRAINSTORMING

(Continued)

Why does it work?

Some of the reasons why brainstorming enhances a group's creativity are that it:

- Increases involvement and participation.
- Produces the most ideas in the shortest time.
- Reduces the need to give the "right" answer.
- Frees up the group; allows the members to have fun and is interesting.
- Reduces the possibility of negative thinking.

QUESTIONS TO STIMULATE YOUR BRAIN CELLS:

1. Can we use this idea elsewhere? As is? With changes?
2. If we change it,; Is there anything else like it? Any related issues?
3. Modify? Change? Rearrange? Meaning, color, motion, sound, odor, taste, form, shape, layout, etc.?
4. Magnify? Add what? More, stronger, larger, new?
5. Minimize? Subtract what? Eliminate, smaller, lighter, slower, split?
6. Substitute? Who, what, when, where?
7. Reverse? Opposite, backwards, upside down, inside out?

DECISION BRIEFING

Elements of a Decision Briefing

- Purpose - Issues
- Outline - Agenda
- Background
- Assumptions
- Alternatives Identified
- Evaluation Criteria
- Analysis of Alternatives
- Recommendation
- Implementation Plan

Things to Expect (from Briefee)

- Challenges to assumptions, definitions, methodology
- Does it comply with or change policy?
- Is the situation sensitive to change?
- Issues with analysis, tradeoffs, recommendations, implementation
- Open/closed questions